



TEST REPORT



Report No. : KES-EM-22T0682-R2
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KES Co., Ltd.
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1. Client

Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do,
Republic of Korea

2. Sample Description

Product name : NETWORK THERMAL CAMERA
Model/Type No. : TNO-4040TR
Variant Model : TNO-4030TR, TNO-L4030TR, TNO-L4040TR
Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED
2. D-TECH CO.,LTD.
Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended Area, Nam Son Ward,
Bac Ninh City, Bac Ninh Province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea
(Suwon Industrial Complex)

3. Date of Receipt : Mar. 26, 2024

4. Test date : Jul. 24, 2022 ~ Jul. 31, 2022

5. Date of Issue : Mar. 27, 2024

6. Test Results : In Compliance

Tested by

Reviewed by

Min Seong, Kim
EMC Test Engineer

Dong Hun, Jang
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.

KES-QP16-F01(00-23-01-01)

KES Co., Ltd.

The authenticity of this test report can be found on the verification page of our website (www.kes.co.kr).

**REPORT REVISION HISTORY**

Date	Test Report No.	Revision History
Aug. 08, 2022	KES-EM-22T0682	Issued
Feb. 24, 2023	KES-EM-22T0682-R1	Change the Applicant and manufacturer at the request of the customer.
Mar. 27, 2024	KES-EM-22T0682-R2	Reissuance due to product name change and addition of derivative models

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1.0 General Product Description

Main Specifications of EUT are:

	TNO-4030TR	TNO-4040TR	TNO-4041TR
VIDEO			
Imaging Device	Uncooled micro bolometer		
Effective Pixels	None		
NETD	< 50mK		
Pixel Size	17μm		
Min. Illumination	None		
LENS			
Focal Length (Zoom Ratio)	13mm fixed focal	19mm fixed focal	
Max. Aperture Ratio	F1.0		
Angular Field of View	H : 48.6° / V : 36.4 / D : 61.6°	H : 32° / V : 24.3° / D : 39.2°	
Min. Object Distance	5m (16.40ft)	11m (36.09ft)	
Focus Control	Fixed		
OPERATIONAL			
Camera Title	Displayed up to 85 characters		
Digital Image Stabilization	Support (Built-in gyro sensor)		
Motion Detection	8ea, 8point polygonal zones		
Privacy Masking	32ea, polygonal zones - Color : Grey / Green / Red / Blue / Black / White - Mosaic		
Video Rotation	Flip, Mirror, Hallway view (90°/270°)		Flip, Mirror
Analytics	Directional detection, Motion detection, Appear/Disappear, Enter/Exit, Loitering, Tampering, Virtual line, Audio detection, Temperature dtection, Sound classification, Shock detection		
Serial Interface	-		RS-485 (Samsung-T, Pelco-D/P, Panasonic, Bosch, AD, GE, Vicon, Honeywell)
Alarm I / O	Input 1ea / Output 2ea		
Alarm Triggers	Analytics, Network disconnect, Alarm input		
Alarm events	File upload via FTP and e-mail Notification via e-mail SD/SDHC/SDXC or NAS recording at event triggers Alarm output Handover		
Audio In	Selectable (mic in/line in) Supply voltage : 2.5VDC (4mA), Input impedance : 2K Ohm		
Audio out	Line out, Max.output level : 1Vrms		
RADIOMETRY			
Temperature detect range	-20°C~130°C (-4°F~266°F)		
Temperature accuracy	±5°C(≤100°C), ±20%(>100°C)		
Temperature detection	3ea rectangular		
Additional	Hybrid palettes, Spot temperature reading		
NETWORK			
Ethernet	RJ-45 (10/100BASE-T)		
Video Compression	H.265/H.264: Main/Baseline/High, MJPEG		
Resolution	640 x 480, 640 x 360, 320 x 240		
Max. Framerate	H.265/H.264 : Max. 30fps/25fps (60Hz/50Hz) MJPEG : Max. 30fps/25fps (60Hz/50Hz)		
Smart Codec	Manual (5ea area), WiseStream II		



	TNO-4030TR	TNO-4040TR	TNO-4041TR
Video Quality Adjustment	H.264/H.265 : Target bitrate level control MJPEG : Target bitrate level control		
Bitrate Control	H.264/H.265 : CBR or VBR MJPEG : VBR		
Streaming	Unicast (20 users) / Multicast Multiple streaming (Up to 10 profiles)		
Audio Compression	G.711 u-law /G.726 Selectable G.726 (ADPCM) 8KHz, G.711 8KHz G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps AAC-LC : 48Kbps at 16KHz		
Protocol	IPv4, IPv6, TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP,RTSP, NTP, HTTP, HTTPS, SSL/TLS, DHCP, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour		
Security	HTTPS (SSL) login authentication Digest login authentication IP address filtering User access log 802.1X authentication (EAP-TLS, EAP-LEAP)		
Edge Storage	Micro SD/SDHC/SDXC 1slot 256GB		
Application Programming Interface	ONVIF Profile S/G/T SUNAPI (HTTP API) Wisenet open platform		
Webpage Language	English, Korean, Chinese, French, Italian, Spanish, German, Japanese, Russian, Swedish, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek		
Web Viewer	Supported OS : Windows 7, 8.1, 10, Mac OS X 10.10, 10.11, 10.12 Recommended Browser : Google Chrome Supported Browser : MS Explorer11, MS Edge, Mozilla Firefox (Windows 64bit only), Apple Safari (Mac OS X only)		
Memory	1024MB RAM, 256MB Flash		
ENVIRONMENTAL			
Operating Temperature / Humidity	-40°C ~ +60°C (-40°F ~ +140°F) / Less than 90% RH		
Storage Temperature / Humidity	-50°C ~ +60°C (-58°F ~ +140°F) / Less than 90% RH		
Certification	IP66, IK10, NEMA4X		
ELECTRICAL			
Input Voltage	PoE (IEEE802.3af, Class3), 24VAC, 12VDC		
Power Consumption	PoE : Max. 10W, typical 8.6W 12VDC : Max. 9W, typical 7.5W 24VAC : Max. 10.5W, typical 8.9W		
MECHANICAL			
Color / Material	White / Aluminium		
RAL Code	RAL9003		
Product dimensions / weight	Φ101.97x401.8mm (4.01x15.82") / 3,124g (6.89lb)		Φ101.97x309mm (4.01x12.17") / 2,452g (5.41lb)

* The latest product information / specification can be found at hanwha-security.co.uk

* Design and specifications are subject to change without notice.

* Wisenet is the proprietary brand of Hanwha Techwin.



1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

☒ AC 230 V, 50 Hz

☒ PoE

1.2 Variant Model Differences

TNO-4030TR, TNO-L4030TR

- A derivative model to the classification of customers simple.

TNO-L4040TR

- Only the difference between the basic model and SW
(change the number of image frames 30 → 8)

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
Thermal Camera	TNO-4040TR	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT



1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/AC Adapter	-	-	-	-
AC/DC Adapter	2ACB022F	-	ChAnnel Well Technology (Guangzhou) Co.,Ltd.	-
PoE Adapter	MA-INJ-4	-	CHANGZHOU WUJIN HONGGUANG RADIO CO, LTD.	-
Notebook	Latitude 5300	8C47BE45C060	DELL INC.	-
Notebook Adapter	HA65NM130	-	Chicony Power Technology(Suzhou)Co.,Ltd.	-
Micro SD Card	-	-	SanDisk	32 GB
Headset	K550	-	Britz®	-
Alarm	PRO-SL	-	SENSOR PRO	-
Button Alarm	-	-	-	-
Smart Phone	SM-N950N	R39JB0C3FB	SAMSUNG	-



1.6 External I/O Cabling

■ AC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	2 Pin	AC/AC Adapter	Line-Out (2 Pin)	1.0	U
	RJ-45	Notebook	RJ-45	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S

■ DC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	2 Pin	AC/DC Adapter	Line-Out (2 Pin)	1.0	U
	RJ-45	Notebook	RJ-45	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S



■ PoE Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	RJ-45 (PoE)	PoE Adapter	RJ-45 (PoE)	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	RJ-45	PoE Adapter	RJ-45 (DATA)	1.0	U
	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S

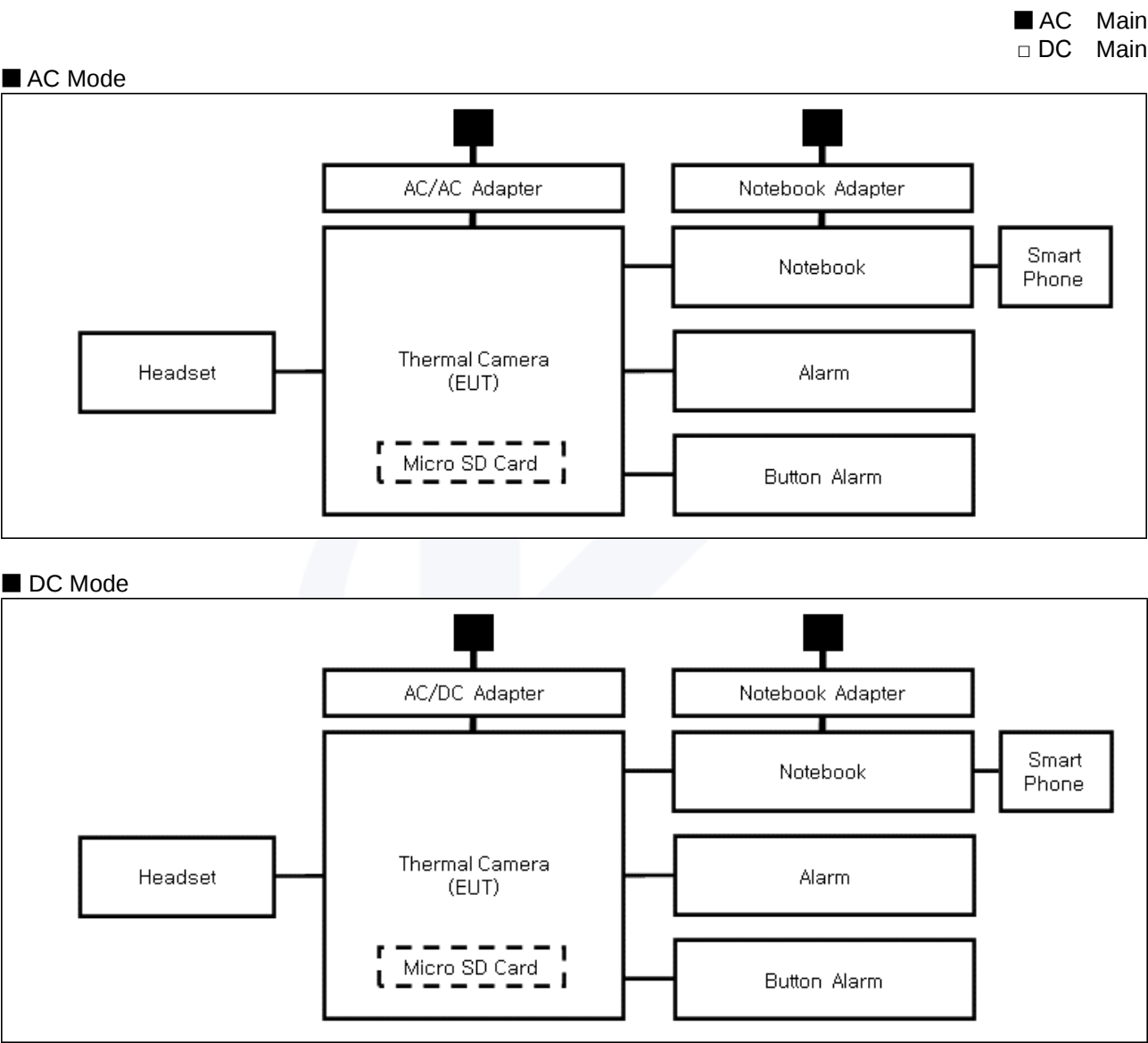
1.7 EUT Operating Mode(s)

Test Mode	operating
Operation	- By connecting to the Web Viewer, checking the video output of EUT and performing a ping test, it was confirmed that the network function is operating normally. - After the test, the Micro SD Card was checked to see if it was recorded normally.

EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

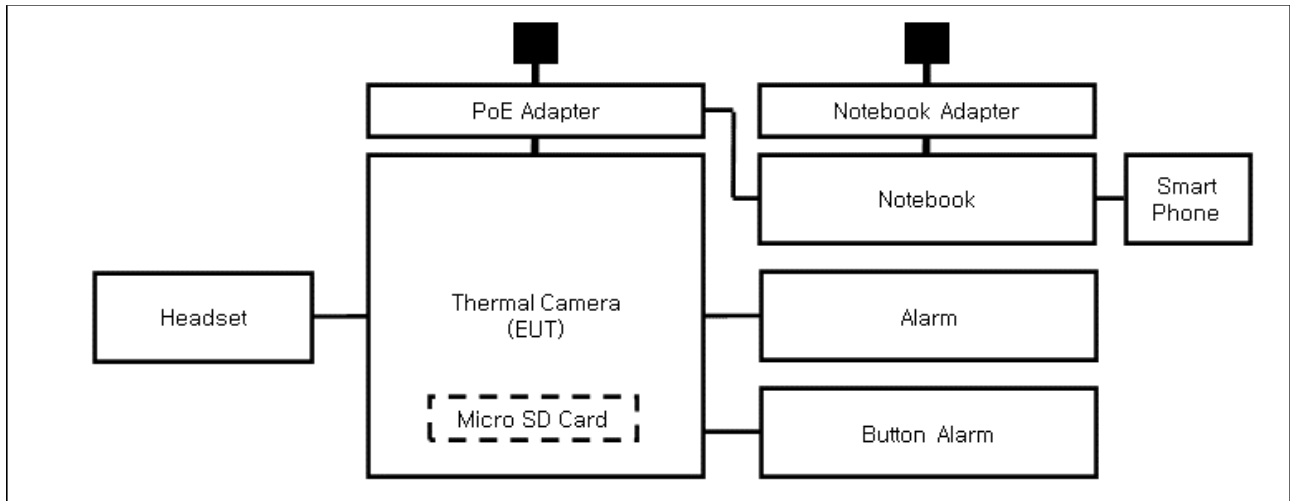


1.8 Configuration





■ PoE Mode





1.9 Remarks when standards applied

- VIDEO port and USB port were excluded from testing because it is the management port.
- PoE port is considered to be wired network port, so power-related test items are excluded.

1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019



**1.12 Laboratory Accreditations and Listings**

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298
JAPAN	VCCI	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)	 C-20136, T-20137, R-20181, G-20176
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004



2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☒ **EMC – Regulations 2016**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013



2.1 Conducted Emissions at Mains Power Ports

Test Date

Jul. 24, 2022

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	12, 28, 2022
☒	LISN	ENV216	R & S	101787	12, 27, 2022
☒	LISN	ESH2-Z5	R & S	100450	12, 27, 2022
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 27, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (45,2 ± 0,3) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.



2.2 Conducted Emissions at Telecommunication Ports

Test Date

Jul. 24, 2022

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test SW	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	12, 28, 2022
☒	LISN	ENV216	R & S	101787	12, 27, 2022
☒	LISN	ESH2-Z5	R & S	100450	12, 27, 2022
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 27, 2022
☒	8-WIRE ISN CAT3,5	ENY81	R & S	100174	12, 28, 2022
☐	ISN	ISN S8	SCHWARZBECK	ISN-S8-0019	03, 07, 2023

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (45,2 ± 0,3) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks- See Appendix A for test data.- For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.



2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Jul. 24, 2022

Test Location☐ OPEN AREA TEST SITE #2☒ SEMI ANECHOIC CHAMBER #4(10m)**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	03, 31, 2023
☒	AMPLIFIER	SCU 01	R & S	100603	11, 24, 2022
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
☒	ATTENUATOR	8491A	HP	32173	03, 08, 2023

Test Conditions

Temperature: (25,0 ± 0,2) °C

Relative Humidity: (45,3 ± 0,4) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.



2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Jul. 25, 2022

Test Location

SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESR7	R & S	101190	08, 03, 2022
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 01, 2023
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

Test Conditions

Temperature: (24,7 ± 0,2) °C

Relative Humidity: (44,8 ± 0,5) % R.H.

Frequency Range of Measurement

1 GHz to 6 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.



2.5 Harmonic Current Emissions

Test Date

Jul. 25, 2022

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2023
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (47,0 ± 0,3) % R.H.

Classification of Equipment for Harmonic Current Emissions

- ☒ Class A
☐ Class B
☐ Class C(Below 25 W)
☐ Class C(Above 25 W)
☐ Class D

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.



2.6 Voltage Fluctuations and Flicker

Test Date

Jul. 25, 2022

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2023
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (27,0 ± 0,2) °C
Relative Humidity: (47,0 ± 0,3) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.



3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 Alarm systems-Part 4: Electromagnetic compatibility Product family standard: Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus

becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test report, based on the following criteria:

Electrostatic discharge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Radiated electromagnetic fields

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.



Fast transient burst / slow high energy voltage surge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators oeuvres at $U = 130 \text{ dB}\mu\text{V}$.

For component of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at $U = 140 \text{ dB}\mu\text{V}$, providing:

- (a) there is no permanent damage or change to the EUT
(e.g. no corruption of memory or changes to programmable settings etc.)
- (b) at $U = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is so minor that the system could still be used; and
- (c) there in no observable deterioration of the picture at $U = 120 \text{ dB}\mu\text{V}$.

Voltage dip/interruption / Voltage variation

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change. The EUT shall meet the acceptance criteria for the functional test, after the conditioning.



3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Jul. 31, 2022

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	02, 24, 2023
☒	HCP	-	KES	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (24,2 ± 0,1) °C
Relative Humidity: (45,7 ± 0,2) % R.H.
Atmospheric Pressure: (99,6 ± 0,0) kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative

Number of Discharge: 10 at all locations for Air discharge
10 at all locations for Contact discharge

Discharge Voltage:	Contact	Air	HCP	VCP
	☐ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
	☐ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
	☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
	☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
	☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

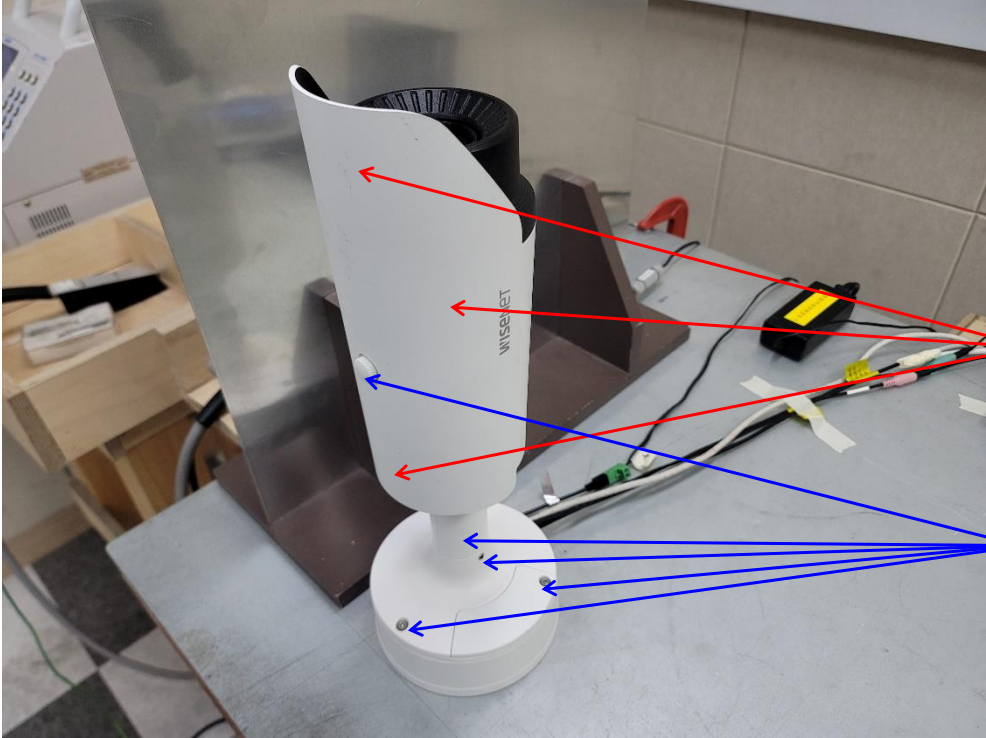
Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

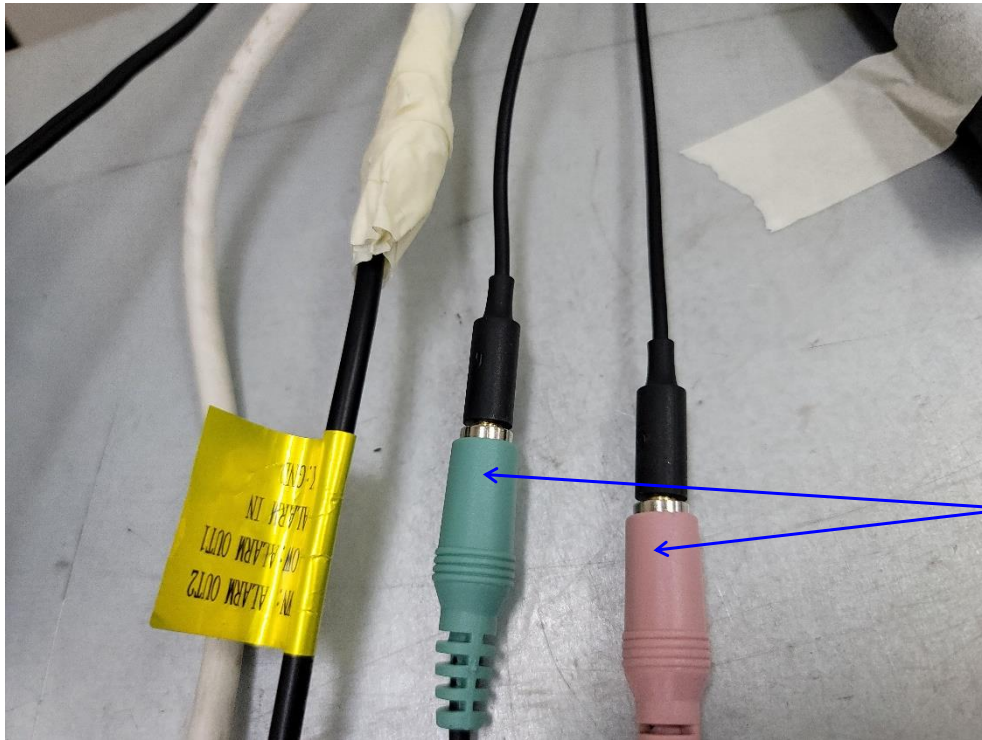
Required Performance Criteria: ☒ Complied



Location of Discharge:
■ AC / DC / PoE Mode

Air
Contact





3

**Test Data****■ AC Mode**

No.	Test Point	Discharge Method	Observations	Remarks
1	HCP Contact	Contact Discharge	Complied	-
2	VCP Contact	Contact Discharge	Complied	-

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Air Discharge	Complied	-
2	Enclosure Metal, Screw	Contact Discharge	Complied	-
3	Audio ports	Contact Discharge	Complied	-

■ DC Mode

No.	Test Point	Discharge Method	Observations	Remarks
1	HCP Contact	Contact Discharge	Complied	-
2	VCP Contact	Contact Discharge	Complied	-

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Air Discharge	Complied	-
2	Enclosure Metal, Screw	Contact Discharge	Complied	-
3	Audio ports	Contact Discharge	Complied	-



■ PoE Mode

Indirect Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	HCP Contact	Contact Discharge	Complied	-
2	VCP Contact	Contact Discharge	Complied	-

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Air Discharge	Complied	-
2	Enclosure Metal, Screw	Contact Discharge	Complied	-
3	Audio ports	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria



3.2 Radiated Electric Field Immunity

Reference Standard

EN IEC 61000-4-3:2020

Test Date

Jul. 27, 2022

Test LocationEMS-RS: ☐ SEMI ANECHOIC CHAMBER #2☒ SEMI ANECHOIC CHAMBER #3**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 03, 2022
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	03, 31, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	04, 04, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	04, 04, 2023
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

Test Conditions

Temperature: (24,1 ± 0,2) °C
Relative Humidity: (44,8 ± 0,3) % R.H.
Atmospheric Pressure: (100,3 ± 0,0) kPa



Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m
☒ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz
☒ 80 MHz to 2,7 GHz

Modulation: ☒ AM, 80 %, 1 kHz sine wave
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

**Test Data****■ AC Mode**

Side Exposed	Observations	
	Horizontal	Vertical
Front	Complied	Complied
Right	Complied	Complied
Back	Complied	Complied
Left	Complied	Complied

■ DC Mode

Side Exposed	Observations	
	Horizontal	Vertical
Front	Complied	Complied
Right	Complied	Complied
Back	Complied	Complied
Left	Complied	Complied

■ PoE Mode

Side Exposed	Observations	
	Horizontal	Vertical
Front	Complied	Complied
Right	Complied	Complied
Back	Complied	Complied
Left	Complied	Complied

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria



3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012

Test Date

Jul. 31, 2022

Test Location

EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	12, 03, 2022
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	03, 31, 2023
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	12, 03, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C
Relative Humidity: (45,2 ± 0,4) % R.H.
Atmospheric Pressure: (99,6 ± 0,0) kPa

Test Specifications

Pulse Amplitude & Polarity:
(AC Power Lines) ☐ ± 1.0 kV ☒ ± 2.0 kV
☐ ± 4.0 kV

Pulse Amplitude & Polarity:
(Other supply / Signal Lines) ☐ ± 0.5 kV ☒ ± 1.0 kV
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 kHz ☒ 100 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

**Test Data**

■ AC Mode

☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L	Complied	Complied
N	Complied	Complied
PE	-	-
L – N	Complied	Complied
L – PE	-	-
N – PE	-	-
L – N – PE	-	-

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45	Complied	Complied
2 Pin (Alarm)	Complied	Complied
2 Pin (Button Alarm)	Complied	Complied



■ DC Mode

☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L	Complied	Complied
N	Complied	Complied
PE	Complied	Complied
L – N	Complied	Complied
L – PE	Complied	Complied
N – PE	Complied	Complied
L – N – PE	Complied	Complied

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45	Complied	Complied
2 Pin (Alarm)	Complied	Complied
2 Pin (Button Alarm)	Complied	Complied

**■ PoE Mode**☐ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L	-	-
N	-	-
PE	-	-
L – N	-	-
L – PE	-	-
N – PE	-	-
L – N – PE	-	-

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45 (PoE)	Complied	Complied
2 Pin (Alarm)	Complied	Complied
2 Pin (Button Alarm)	Complied	Complied

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**PASS Required Performance Criteria



3.4 Surge Transients

Reference Standard

EN 61000-4-5:2014/A1:2017

Test Date

Jul. 30, 2022

Test Location

EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	12, 03, 2022
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	03, 31, 2023
☒	CDN	CNV 508N1	EM TEST	P1610176296	12, 03, 2022

Test Conditions

Temperature: (24,6 ± 0,1) °C
Relative Humidity: (45,0 ± 0,3) % R.H.
Atmospheric Pressure: (99,7 ± 0,0) kPa

**Test Specifications****AC Power Lines**

Source Impedance: 12 ohm for common Mode and 2 ohm for differential Mode

Surge Amplitude : Common Mode
☒ (0,5 / 1,0 / 2,0) kV
Differential Mode
☒ (0,5 / 1,0) kV

Number of Surges: ☒ 5 surges per angleAngle: ☒ 0°, 90°, 180°, 270° (input a.c. power port)Polarity: ☒ Positive & NegativeRepetition Rate: ☐ 1 surge per min ☒ 1 surge per 30 sec.Required Performance Criteria: ☒ Complied**Other supply / Signal Lines**

Source Impedance: 42 ohm for common Mode

Surge Amplitude: Common Mode
☒ (0,5 / 1,0) kV

Number of Surges: ☒ 5 SurgesPolarity: ☒ Positive & NegativeRepetition Rate: ☒ 1 surge per min ☐ 1 surge per 30 sec.Required Performance Criteria: ☒ Complied

**Test Data**

■ AC Mode

☒ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – N	Complied	Complied

☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – PE	-	-
N – PE	-	-

Signal Lines☒ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45	CDN	Complied	Complied
	LINE	Complied	Complied

■ DC Mode

☒ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – N	Complied	Complied

☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – PE	Complied	Complied
N – PE	Complied	Complied

Signal Lines☒ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45	CDN	Complied	Complied
	LINE	Complied	Complied

☒ PoE Mode☐ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – N	-	-

☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – PE	-	-
N – PE	-	-

Signal Lines☒ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45 (PoE)	CDN	Complied	Complied
	LINE	Complied	Complied

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**PASS Required Performance Criteria



3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Jul. 28, 2022

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.12	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 24, 2022
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 24, 2022
☒	CDN	CDN M016	TESEQ	43694	11, 24, 2022
☒	CDN	CDN M016	TESEQ	43697	11, 24, 2022
☒	CDN	CDN T8RJ45	EM TEST	0909-09	08, 03, 2022
☐	CDN	CDN ST08A	TESEQ	43886	11, 24, 2022
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 25, 2022

Test Conditions

Temperature: (25,0 ± 0,2) °C
Relative Humidity: (44,6 ± 0,3) % R.H.
Atmospheric Pressure: (100,0 ± 0,0) kPa



Test Specifications

Frequency range: ☒ 150 kHz to 100 MHz ☐ 150 kHz to 80 MHz

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms
☒ 10 Vrms

Modulation: ☒ AM, 80 %, 1 kHz sine wave
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

Required Performance Criteria: ☒ Complied



**Test Data****■ AC Mode**☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
2 Pin (Alarm)	Clamp	Complied
2 Pin (Button Alarm)	Clamp	Complied

■ DC Mode☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N - PE	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
2 Pin (Alarm)	Clamp	Complied
2 Pin (Button Alarm)	Clamp	Complied

**■ PoE Mode**☐ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45 (PoE)	CDN	Complied
2 Pin (Alarm)	Clamp	Complied
2 Pin (Button Alarm)	Clamp	Complied

Notes: CDN = Coupling Decoupling Network
"blank" = Not performed

Observations:

Complied – No degradation of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**PASS Required Performance Criteria



3.6 Voltage Dips and Short Interruptions

Reference Standard

EN IEC 61000-4-11:2020

Test Date

Jul. 31, 2022

Test Location

EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	03, 31, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	03, 31, 2023

Test Conditions

Temperature: (24,5 ± 0,1) °C
Relative Humidity: (45,1 ± 0,1) % R.H.
Atmospheric Pressure: (99,6 ± 0,0) kPa

**Test Specifications & Observations/Remarks**

■ AC Mode

- Voltage Dips and Short Interruptions

<u>Test Level</u>	<u>Duration [in period/ms (50 Hz)]</u>	<u>Results</u>
☒ 20 % dip	☒ 250 / 5 000	<u>Complied</u>
☒ 30 % dip	☒ 25 / 500	<u>Complied</u>
☒ 60 % dip	☒ 10 / 200	<u>Complied</u>
☒ 100 % dip	☒ 250 / 5 000	<u>Degradation</u>

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>



■ DC Mode

- Voltage Dips and Short Interruptions

<u>Test Level</u>	<u>Duration [in period/ms (50 Hz)]</u>	<u>Results</u>
☒ 20 % dip	☒ 250 / 5 000	<u>Complied</u>
☒ 30 % dip	☒ 25 / 500	<u>Complied</u>
☒ 60 % dip	☒ 10 / 200	<u>Complied</u>
☒ 100 % dip	☒ 250 / 5 000	<u>Degradation</u>

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>

Observations:

Complied – No degradation of function

Degradation - See "Remarks "

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria
☐ NOT APPLICABLE

Remarks

During the test(100%, 250cycle), EUT was turned off but after the test, it was recovered by no operator's intervention.



APPENDIX A – TEST DATA

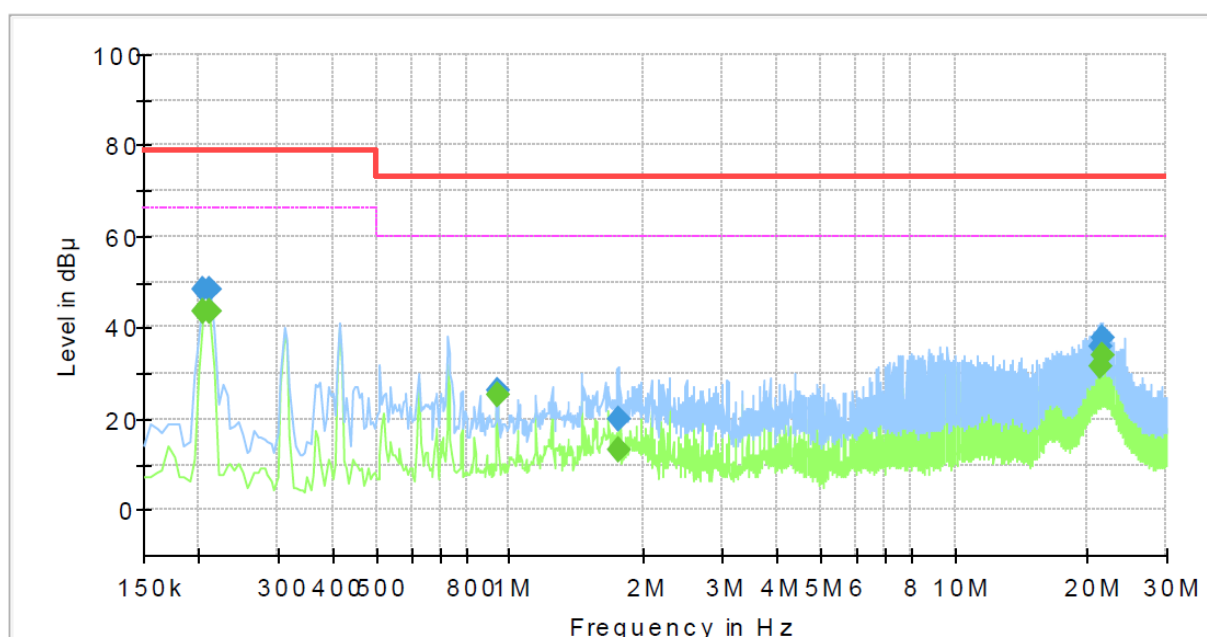
Conducted Emissions at Mains Power Ports

■ AC Mode

[HOT]

Common Information

Test Description: Conducted Emission
Model No.: TNO-4040TR
Phase: L1
Mode: AC
Operator Name: KES



Final Result

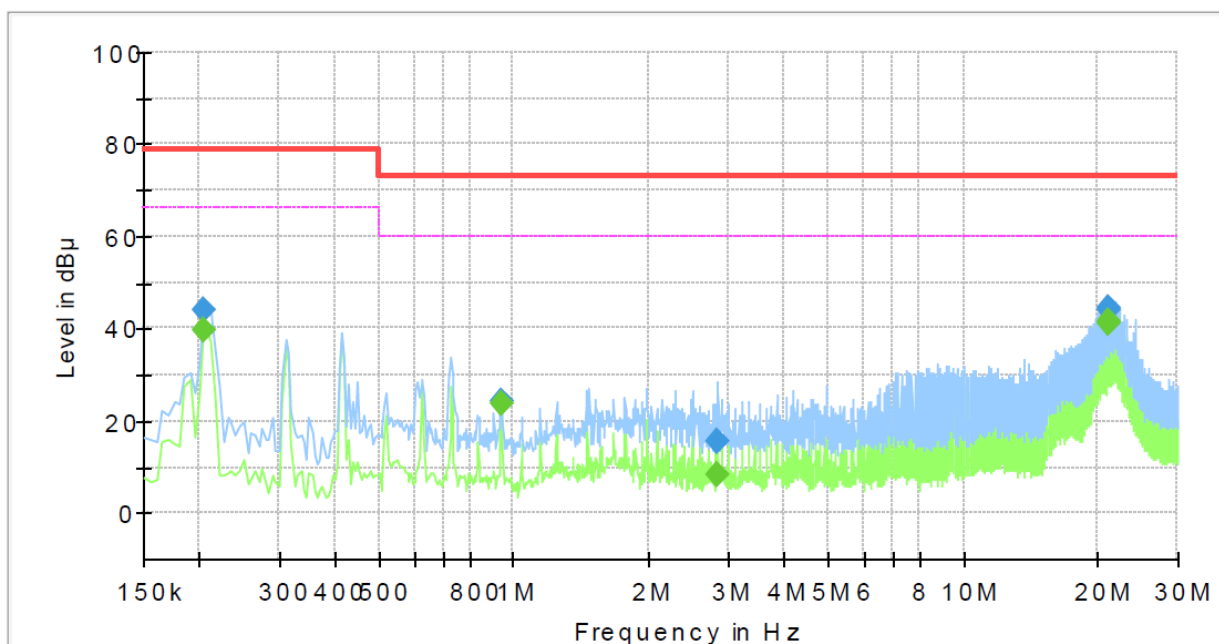
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.205000	---	43.63	66.00	22.37	1000.0	9.000	L1	19.4
0.205000	48.30	---	79.00	30.70	1000.0	9.000	L1	19.4
0.210000	---	43.78	66.00	22.22	1000.0	9.000	L1	19.4
0.210000	48.47	---	79.00	30.53	1000.0	9.000	L1	19.4
0.935000	---	25.14	60.00	34.86	1000.0	9.000	L1	20.1
0.935000	26.11	---	73.00	46.89	1000.0	9.000	L1	20.1
1.750000	---	13.01	60.00	46.99	1000.0	9.000	L1	20.3
1.750000	19.97	---	73.00	53.03	1000.0	9.000	L1	20.3
21.375000	---	31.61	60.00	28.39	1000.0	9.000	L1	20.1
21.375000	36.02	---	73.00	36.98	1000.0	9.000	L1	20.1
21.480000	---	33.72	60.00	26.28	1000.0	9.000	L1	20.1
21.480000	37.77	---	73.00	35.23	1000.0	9.000	L1	20.1



[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-4040TR
Phase:	N
Mode:	AC
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.205000	---	39.57	66.00	26.43	1000.0	9.000	N	19.4
0.205000	43.88	---	79.00	35.12	1000.0	9.000	N	19.4
0.935000	---	23.61	60.00	36.39	1000.0	9.000	N	20.1
0.935000	24.31	---	73.00	48.69	1000.0	9.000	N	20.1
2.845000	---	8.46	60.00	51.54	1000.0	9.000	N	20.2
2.845000	15.77	---	73.00	57.23	1000.0	9.000	N	20.2
21.075000	---	41.16	60.00	18.84	1000.0	9.000	N	20.2
21.075000	44.08	---	73.00	28.92	1000.0	9.000	N	20.2
21.180000	---	41.61	60.00	18.39	1000.0	9.000	N	20.2
21.180000	44.53	---	73.00	28.47	1000.0	9.000	N	20.2

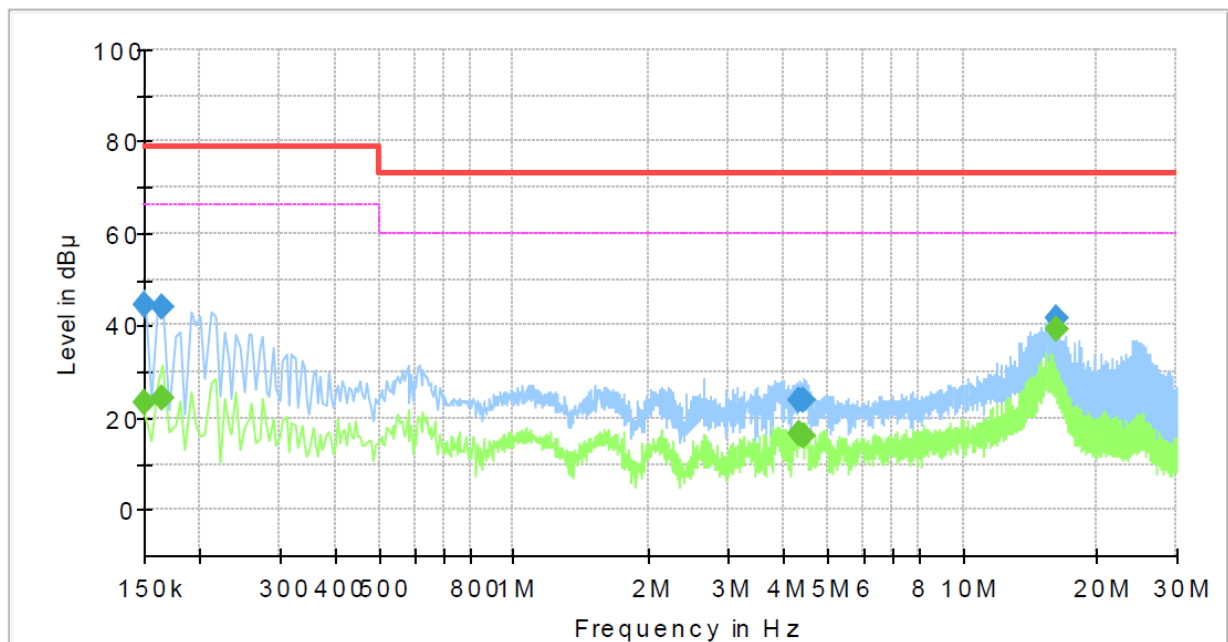


■ DC Mode

[HOT]

Common Information

Test Description: Conducted Emission
Model No.: TNO-4040TR
Phase: L1
Mode: DC
Operator Name: KES



Final Result

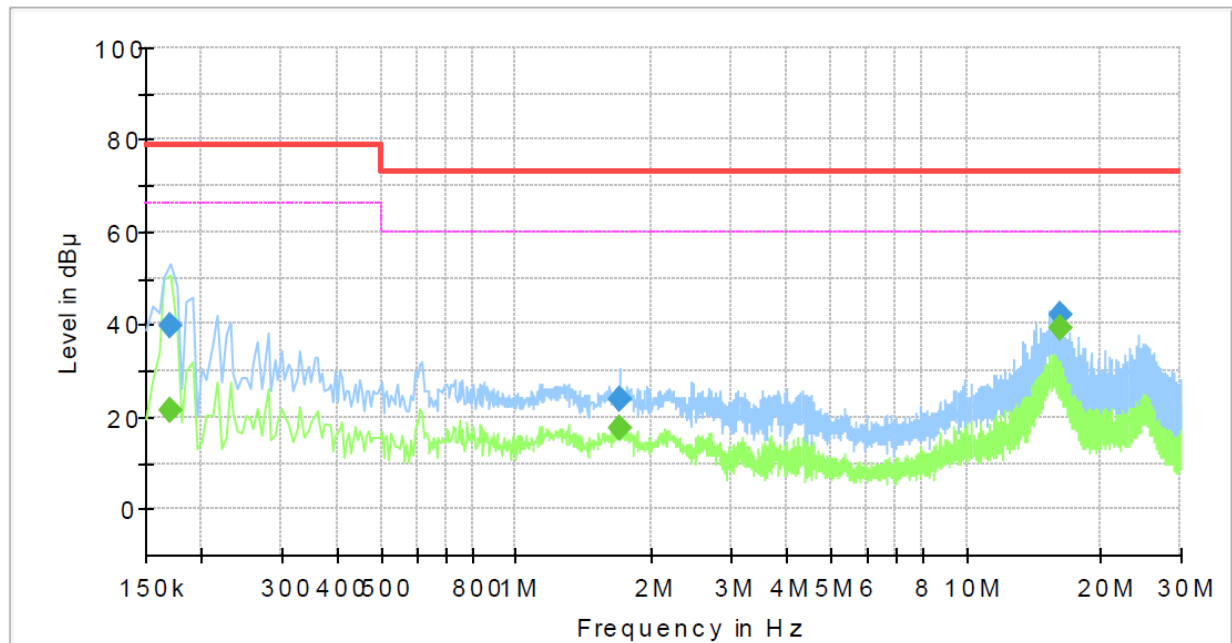
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	23.42	66.00	42.58	1000.0	9.000	L1	19.4
0.150000	44.33	---	79.00	34.67	1000.0	9.000	L1	19.4
0.165000	---	24.48	66.00	41.52	1000.0	9.000	L1	19.4
0.165000	43.93	---	79.00	35.07	1000.0	9.000	L1	19.4
4.320000	---	16.42	60.00	43.58	1000.0	9.000	L1	19.8
4.320000	23.74	---	73.00	49.26	1000.0	9.000	L1	19.8
4.420000	---	16.05	60.00	43.95	1000.0	9.000	L1	19.8
4.420000	23.61	---	73.00	49.39	1000.0	9.000	L1	19.8
16.230000	---	39.03	60.00	20.97	1000.0	9.000	L1	19.9
16.230000	41.56	---	73.00	31.44	1000.0	9.000	L1	19.9



[NEUTRAL]

Common Information

Test Description: Conducted Emission
Model No.: TNO-4040TR
Phase: N
Mode: DC
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.170000	---	21.22	66.00	44.78	1000.0	9.000	N	19.4
0.170000	39.85	---	79.00	39.15	1000.0	9.000	N	19.4
1.695000	---	17.45	60.00	42.55	1000.0	9.000	N	20.3
1.695000	23.74	---	73.00	49.26	1000.0	9.000	N	20.3
16.230000	---	39.39	60.00	20.61	1000.0	9.000	N	19.9
16.230000	42.02	---	73.00	30.98	1000.0	9.000	N	19.9

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

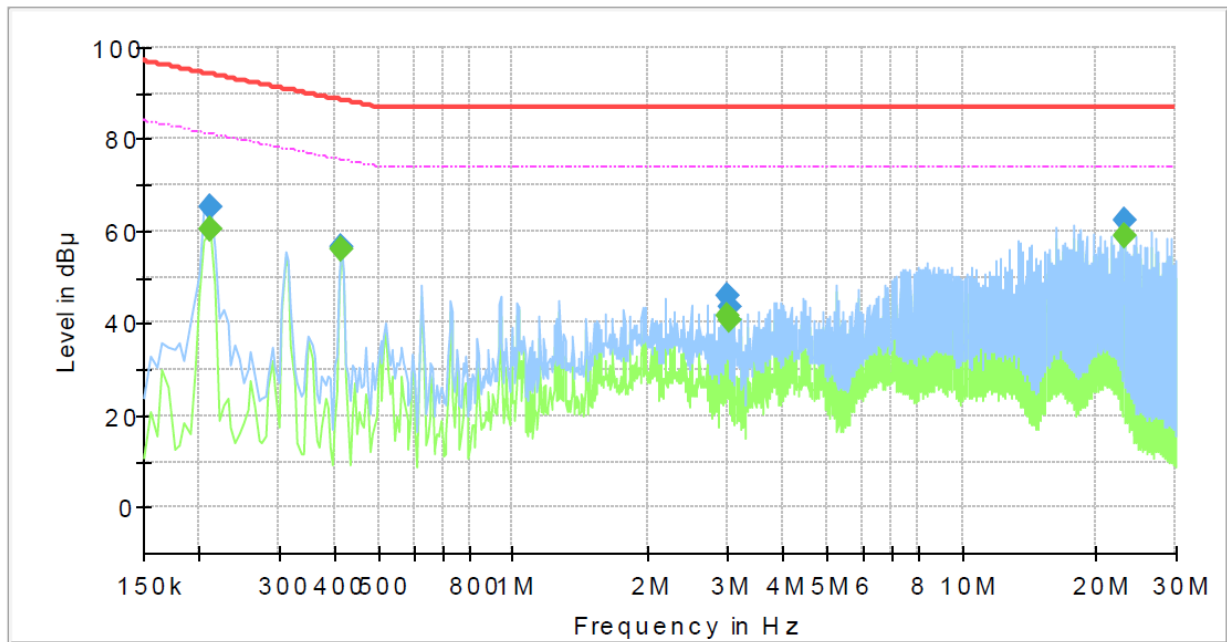
**Conducted Emissions at Telecommunication Ports**

■ AC Mode

[100 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: TNO-4040TR
Mode : AC
Speed : 100 Mbps
Operator Name: KES

**Final_Result**

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	---	60.45	81.21	20.76	1000.0	9.000	Single Line	19.7
0.210000	65.13	---	94.21	29.08	1000.0	9.000	Single Line	19.7
0.415000	---	56.12	75.55	19.43	1000.0	9.000	Single Line	19.7
0.415000	56.62	---	88.55	31.93	1000.0	9.000	Single Line	19.7
3.010000	---	41.82	74.00	32.18	1000.0	9.000	Single Line	20.0
3.010000	45.84	---	87.00	41.16	1000.0	9.000	Single Line	20.0
3.040000	---	40.74	74.00	33.26	1000.0	9.000	Single Line	20.0
3.040000	43.65	---	87.00	43.35	1000.0	9.000	Single Line	20.0
23.130000	---	58.86	74.00	15.14	1000.0	9.000	Single Line	20.1
23.130000	62.20	---	87.00	24.80	1000.0	9.000	Single Line	20.1

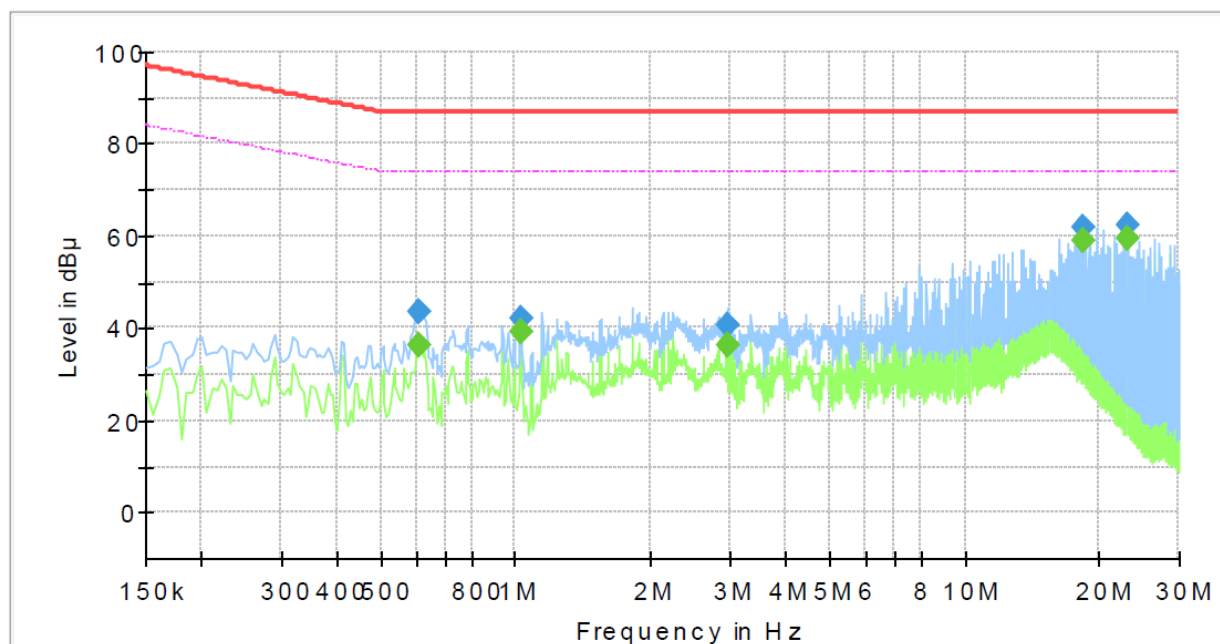


■ DC Mode

[100 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: TNO-4040TR
Mode : DC
Speed : 100 Mbps
Operator Name: KES

**Final Result**

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.610000	---	36.50	74.00	37.50	1000.0	9.000	Single Line	19.8
0.610000	43.65	---	87.00	43.35	1000.0	9.000	Single Line	19.8
1.025000	---	39.19	74.00	34.81	1000.0	9.000	Single Line	20.0
1.025000	42.01	---	87.00	44.99	1000.0	9.000	Single Line	20.0
2.975000	---	36.29	74.00	37.71	1000.0	9.000	Single Line	20.0
2.975000	40.87	---	87.00	46.13	1000.0	9.000	Single Line	20.0
18.305000	---	58.90	74.00	15.10	1000.0	9.000	Single Line	19.8
18.305000	61.71	---	87.00	25.29	1000.0	9.000	Single Line	19.8
23.130000	---	59.53	74.00	14.47	1000.0	9.000	Single Line	20.1
23.130000	62.57	---	87.00	24.43	1000.0	9.000	Single Line	20.1

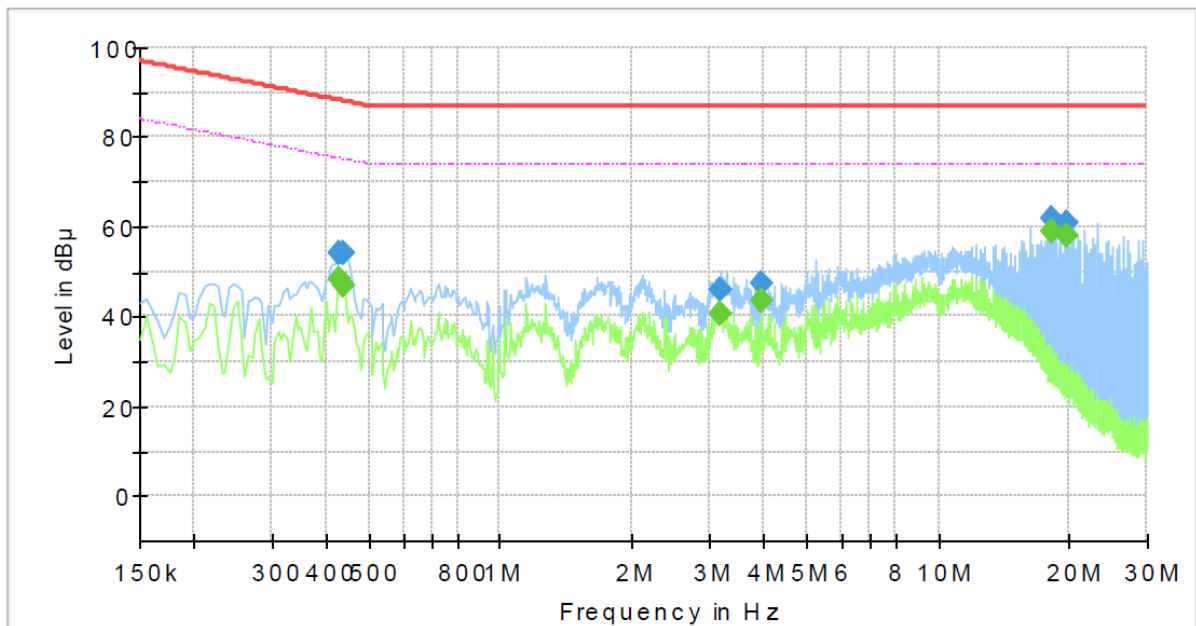


■ PoE Mode

[100 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: TNO-4040TR
Mode : PoE
Speed : 100 Mbps
Operator Name: KES

**Final Result**

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.430000	---	48.29	75.25	26.96	1000.0	9.000	Single Line	19.7
0.430000	54.21	---	88.25	34.04	1000.0	9.000	Single Line	19.7
0.440000	---	46.88	75.06	28.18	1000.0	9.000	Single Line	19.7
0.440000	54.22	---	88.06	33.84	1000.0	9.000	Single Line	19.7
3.190000	---	40.54	74.00	33.46	1000.0	9.000	Single Line	20.0
3.190000	46.16	---	87.00	40.84	1000.0	9.000	Single Line	20.0
3.955000	---	43.77	74.00	30.23	1000.0	9.000	Single Line	19.7
3.955000	47.20	---	87.00	39.80	1000.0	9.000	Single Line	19.7
18.245000	---	58.93	74.00	15.07	1000.0	9.000	Single Line	19.8
18.245000	61.67	---	87.00	25.33	1000.0	9.000	Single Line	19.8
19.710000	---	58.04	74.00	15.96	1000.0	9.000	Single Line	20.0
19.710000	60.89	---	87.00	26.11	1000.0	9.000	Single Line	20.0

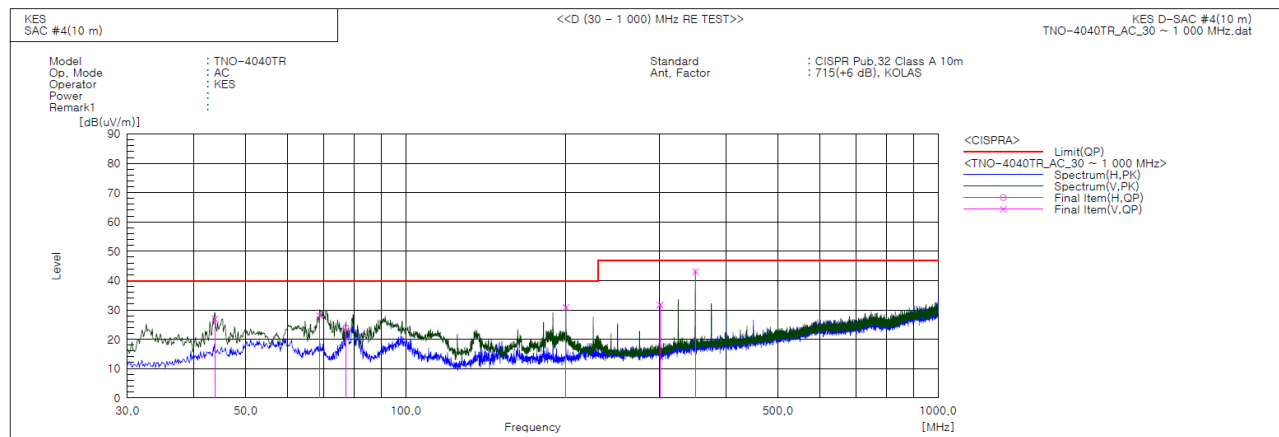
◆ Calculation

$$\text{QuasiPeak [dBuV]} / \text{CAverage [dBuV]} = \text{Reading Value [dBuV]} + \text{Corr. [dB]}$$

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

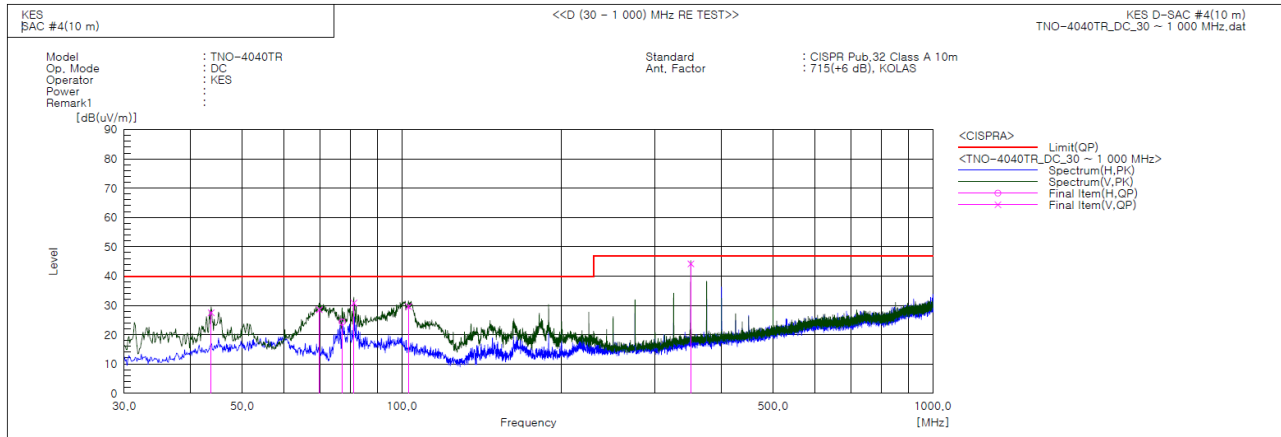
Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

**Radiated Electric Field Emissions(Below 1 GHz)****■ AC Mode****Final Result**

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	43.823	V	48.6	-21.6	27.0	40.0	13.0	116.0	110.0	
2	68.921	V	52.6	-24.5	28.1	40.0	11.9	132.0	207.0	
3	77.166	H	51.3	-27.4	23.9	40.0	16.1	375.0	62.0	
4	199.993	V	51.9	-21.0	30.9	40.0	9.1	100.0	200.0	
5	300.024	V	49.7	-18.0	31.7	47.0	15.3	100.0	37.0	
6	349.979	V	58.4	-15.3	43.1	47.0	3.9	100.0	1.0	



■ DC Mode

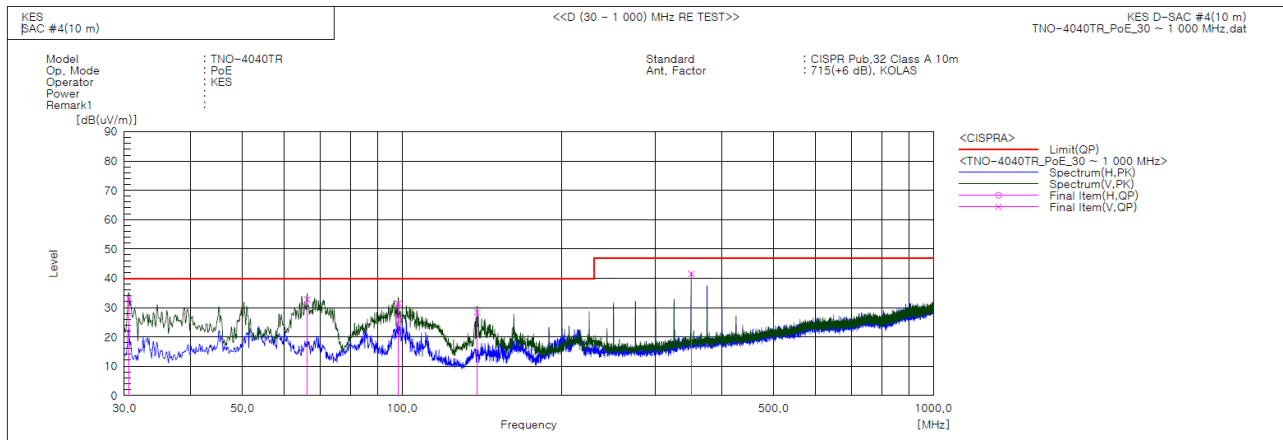


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	43.701	V	49.1	-21.6	27.5	40.0	12.5	100.0	11.1	
2	69.891	V	53.3	-24.8	28.5	40.0	11.5	100.0	158.1	
3	77.166	H	51.7	-27.4	24.3	40.0	15.7	400.0	355.9	
4	81.168	V	58.4	-27.6	30.8	40.0	9.2	150.0	263.5	
5	102.871	V	52.1	-22.5	29.6	40.0	10.4	150.0	172.1	
6	349.979	V	59.5	-15.3	44.2	47.0	2.8	100.0	6.1	



■ PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	30.606	V	58.3	-25.2	33.1	40.0	6.9	105.0	286.0	
2	66.254	V	56.3	-23.6	32.7	40.0	7.3	113.0	109.0	
3	98.385	V	54.1	-22.7	31.4	40.0	8.6	132.0	0.0	
4	98.385	H	48.7	-22.7	26.0	40.0	14.0	400.0	170.0	
5	138.398	V	53.9	-25.5	28.4	40.0	11.6	109.0	198.0	
6	349.979	V	56.8	-15.3	41.5	47.0	5.5	100.0	162.0	

◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

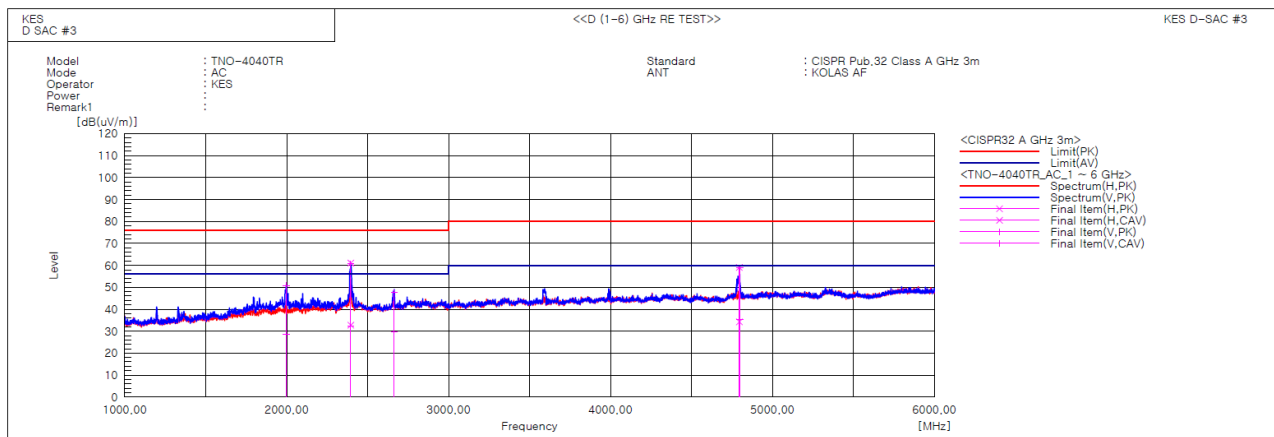
Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



Radiated Electric Field Emissions(Above 1 GHz)

AC Mode

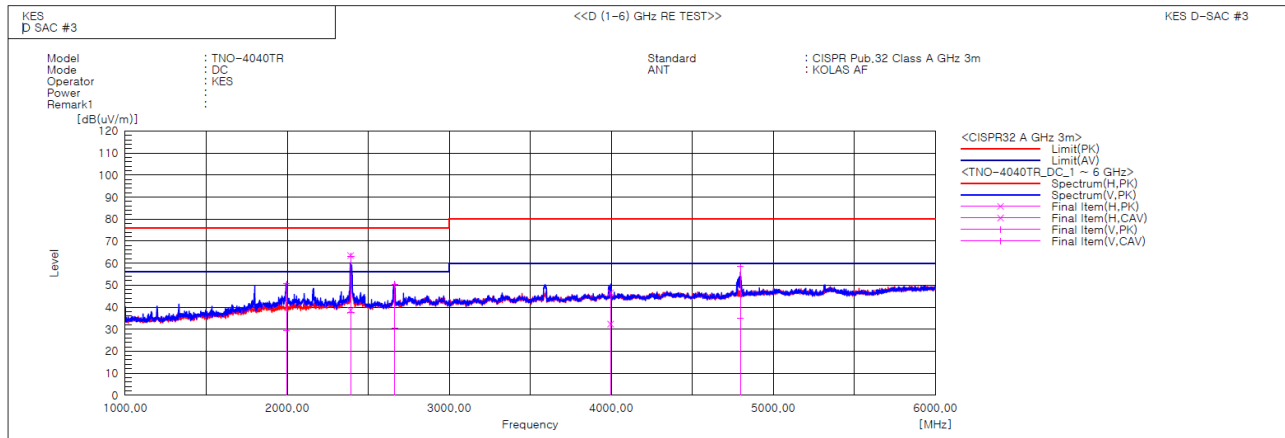


Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1996.092	V	51.8	29.7	-1.0	50.8	28.7	76.0	56.0	25.2	27.3	100.0	47.9	
2	2394.841	H	59.9	31.6	1.2	61.1	32.8	76.0	56.0	14.9	23.2	100.0	262.4	
3	2395.100	V	59.5	31.1	1.2	60.7	32.3	76.0	56.0	15.3	23.7	100.0	60.9	
4	2664.311	V	46.3	28.4	1.3	47.6	29.7	76.0	56.0	28.4	26.3	100.0	11.4	
5	4795.331	H	51.5	26.7	7.6	59.1	34.3	80.0	60.0	20.9	25.7	100.0	126.7	
6	4797.450	V	51.2	27.8	7.6	58.8	35.4	80.0	60.0	21.2	24.6	100.0	4.2	



■ DC Mode

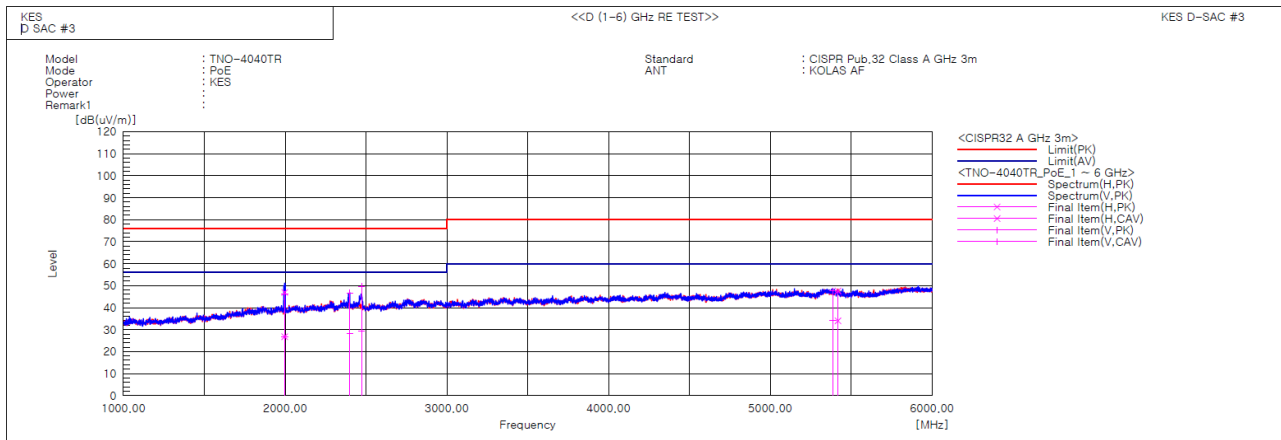


Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1995.153	V	51.6	30.3	-1.1	50.5	29.2	76.0	56.0	25.5	26.8	100.0	34.7	
2	2390.760	H	62.3	37.4	1.2	63.5	38.6	76.0	56.0	12.5	17.4	100.0	262.5	
3	2391.520	V	61.9	36.5	1.2	63.1	37.7	76.0	56.0	12.9	18.3	100.0	335.1	
4	2663.236	V	49.1	29.2	1.3	50.4	30.5	76.0	56.0	25.6	25.5	100.0	354.0	
5	3995.313	H	40.8	26.5	5.8	46.6	32.3	80.0	60.0	33.4	27.7	100.0	259.6	
6	4797.071	V	51.0	27.2	7.6	58.6	34.8	80.0	60.0	21.4	25.2	100.0	357.6	



■ PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1996.031	H	47.9	27.8	-1.0	46.9	26.8	76.0	56.0	29.1	29.2	100.0	195.1	
2	1997.731	V	47.1	27.7	-1.0	46.1	26.7	76.0	56.0	29.9	29.3	100.0	151.7	
3	2399.800	V	45.5	27.0	1.2	46.7	28.2	76.0	56.0	29.3	27.8	100.0	11.8	
4	2472.270	V	48.6	28.2	1.1	49.7	29.3	76.0	56.0	26.3	26.7	100.0	7.7	
5	5386.258	V	38.0	24.6	9.5	47.5	34.1	80.0	60.0	32.5	25.9	100.0	234.9	
6	5418.585	H	38.1	24.5	9.5	47.6	34.0	80.0	60.0	32.4	26.0	100.0	158.8	

◆ Calculation

Result(PK/CAV) [dB(μV/m)] = (Reading(PK/CAV)[dB(μV)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

**Harmonic Current Emissions and Voltage Fluctuations and Flicker**

■ AC Mode

Average harmonic current results				
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.079			
2	0.001	0.059	1.080	n/a
3	0.029	1.247	2.300	PASS
4	0.001	0.172	0.430	n/a
5	0.027	2.331	1.140	PASS
6	0.001	0.219	0.300	n/a
7	0.013	1.694	0.770	PASS
8	0.001	0.284	0.230	n/a
9	0.005	1.307	0.400	PASS
10	0.001	0.387	0.184	n/a
11	0.001	0.317	0.330	n/a
12	0.001	0.397	0.153	n/a
13	0.002	1.064	0.210	n/a
14	0.001	0.498	0.131	n/a
15	0.002	1.085	0.150	n/a
16	0.001	0.537	0.115	n/a
17	0.001	1.104	0.132	n/a
18	0.001	0.645	0.102	n/a
19	0.001	0.655	0.118	n/a
20	0.001	0.781	0.092	n/a
21	0.001	0.801	0.161	n/a
22	0.001	0.745	0.084	n/a
23	0.001	0.718	0.147	n/a
24	0.001	0.837	0.077	n/a
25	0.001	0.833	0.135	n/a
26	0.001	0.868	0.071	n/a
27	0.001	1.118	0.125	n/a
28	0.001	0.991	0.066	n/a
29	0.001	0.720	0.116	n/a
30	0.001	1.137	0.061	n/a
31	0.001	0.776	0.109	n/a
32	0.001	1.034	0.058	n/a
33	0.001	0.733	0.102	n/a
34	0.001	1.191	0.054	n/a
35	0.001	0.758	0.096	n/a
36	0.001	1.243	0.051	n/a
37	0.001	1.084	0.091	n/a
38	0.001	1.290	0.048	n/a
39	0.001	0.752	0.087	n/a
40	0.001	1.440	0.046	n/a

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.



Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.080			
2	0.001	0.066	1.620	n/a
3	0.029	0.839	3.450	PASS
4	0.001	0.129	0.645	n/a
5	0.027	1.565	1.710	PASS
6	0.001	0.165	0.450	n/a
7	0.013	1.138	1.155	PASS
8	0.001	0.216	0.345	n/a
9	0.006	0.933	0.600	PASS
10	0.001	0.283	0.276	n/a
11	0.001	0.271	0.495	n/a
12	0.001	0.291	0.230	n/a
13	0.003	0.820	0.315	n/a
14	0.001	0.417	0.197	n/a
15	0.002	0.830	0.225	n/a
16	0.001	0.412	0.173	n/a
17	0.002	0.814	0.199	n/a
18	0.001	0.582	0.153	n/a
19	0.001	0.621	0.178	n/a
20	0.001	0.571	0.138	n/a
21	0.001	0.863	0.161	n/a
22	0.001	0.550	0.125	n/a
23	0.001	0.799	0.147	n/a
24	0.001	0.629	0.115	n/a
25	0.001	0.909	0.135	n/a
26	0.001	0.672	0.106	n/a
27	0.001	1.190	0.125	n/a
28	0.001	0.869	0.099	n/a
29	0.001	0.789	0.116	n/a
30	0.001	0.907	0.092	n/a
31	0.001	0.847	0.109	n/a
32	0.001	0.815	0.086	n/a
33	0.001	0.801	0.102	n/a
34	0.001	1.059	0.081	n/a
35	0.001	0.845	0.096	n/a
36	0.001	0.946	0.077	n/a
37	0.001	1.201	0.091	n/a
38	0.001	0.963	0.073	n/a
39	0.001	0.847	0.087	n/a
40	0.001	1.312	0.069	n/a

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.



■ DC Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.051			
2	0.002	0.153	1.080	n/a
3	0.036	1.568	2.300	PASS
4	0.003	0.617	0.430	n/a
5	0.035	3.095	1.140	PASS
6	0.002	0.610	0.300	n/a
7	0.035	4.494	0.770	PASS
8	0.002	0.819	0.230	n/a
9	0.033	8.203	0.400	PASS
10	0.002	1.340	0.184	n/a
11	0.031	9.529	0.330	PASS
12	0.002	1.189	0.153	n/a
13	0.031	14.530	0.210	PASS
14	0.002	1.162	0.131	n/a
15	0.029	19.281	0.150	PASS
16	0.001	1.192	0.115	n/a
17	0.027	20.123	0.132	PASS
18	0.001	1.370	0.102	n/a
19	0.024	20.391	0.118	PASS
20	0.001	1.381	0.092	n/a
21	0.022	13.553	0.161	PASS
22	0.001	1.200	0.084	n/a
23	0.019	13.279	0.147	PASS
24	0.001	1.210	0.077	n/a
25	0.017	12.740	0.135	PASS
26	0.001	1.112	0.071	n/a
27	0.015	12.034	0.125	PASS
28	0.001	1.347	0.066	n/a
29	0.013	11.039	0.116	PASS
30	0.001	1.416	0.061	n/a
31	0.011	9.939	0.109	PASS
32	0.001	1.261	0.058	n/a
33	0.009	8.704	0.102	PASS
34	0.001	1.464	0.054	n/a
35	0.007	7.148	0.096	PASS
36	0.001	1.285	0.051	n/a
37	0.005	5.819	0.091	PASS
38	0.001	1.397	0.048	n/a
39	0.004	4.577	0.087	n/a
40	0.001	1.402	0.046	n/a

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.



Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.051			
2	0.002	0.124	1.620	n/a
3	0.036	1.052	3.450	PASS
4	0.003	0.500	0.645	n/a
5	0.036	2.081	1.710	PASS
6	0.002	0.483	0.450	n/a
7	0.035	3.012	1.155	PASS
8	0.002	0.639	0.345	n/a
9	0.034	5.584	0.600	PASS
10	0.003	1.094	0.276	n/a
11	0.032	6.493	0.495	PASS
12	0.002	0.920	0.230	n/a
13	0.031	9.738	0.315	PASS
14	0.002	0.917	0.197	n/a
15	0.029	12.958	0.225	PASS
16	0.002	0.960	0.173	n/a
17	0.027	13.491	0.199	PASS
18	0.002	1.096	0.153	n/a
19	0.024	13.672	0.178	PASS
20	0.002	1.099	0.138	n/a
21	0.022	13.646	0.161	PASS
22	0.001	0.996	0.125	n/a
23	0.020	13.478	0.147	PASS
24	0.001	1.022	0.115	n/a
25	0.017	12.949	0.135	PASS
26	0.001	0.968	0.106	n/a
27	0.015	12.132	0.125	PASS
28	0.001	1.096	0.099	n/a
29	0.013	11.159	0.116	PASS
30	0.001	1.133	0.092	n/a
31	0.011	10.077	0.109	PASS
32	0.001	1.003	0.086	n/a
33	0.009	8.831	0.102	PASS
34	0.001	1.233	0.081	n/a
35	0.007	7.300	0.096	PASS
36	0.001	0.987	0.077	n/a
37	0.005	5.929	0.091	PASS
38	0.001	1.145	0.073	n/a
39	0.004	4.698	0.087	n/a
40	0.001	1.138	0.069	n/a

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.



Test Data - Voltage Fluctuations

Maximum Flicker results

■ AC Mode

Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

■ DC Mode

Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS



Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ DC Mode





Conducted Emissions at Telecommunication Ports

■ DC Mode





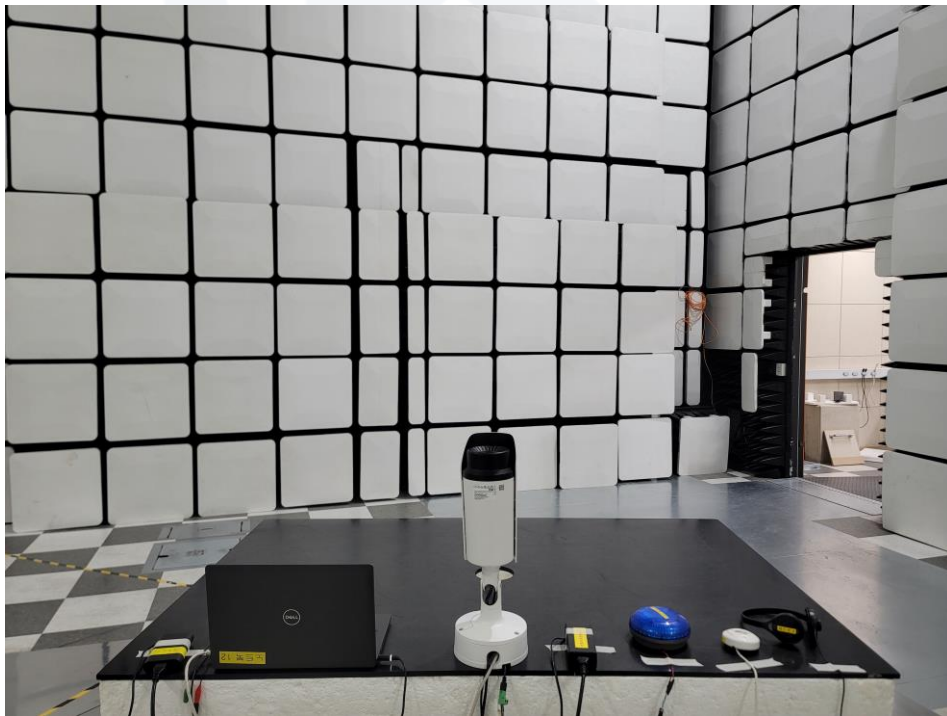
■ PoE Mode





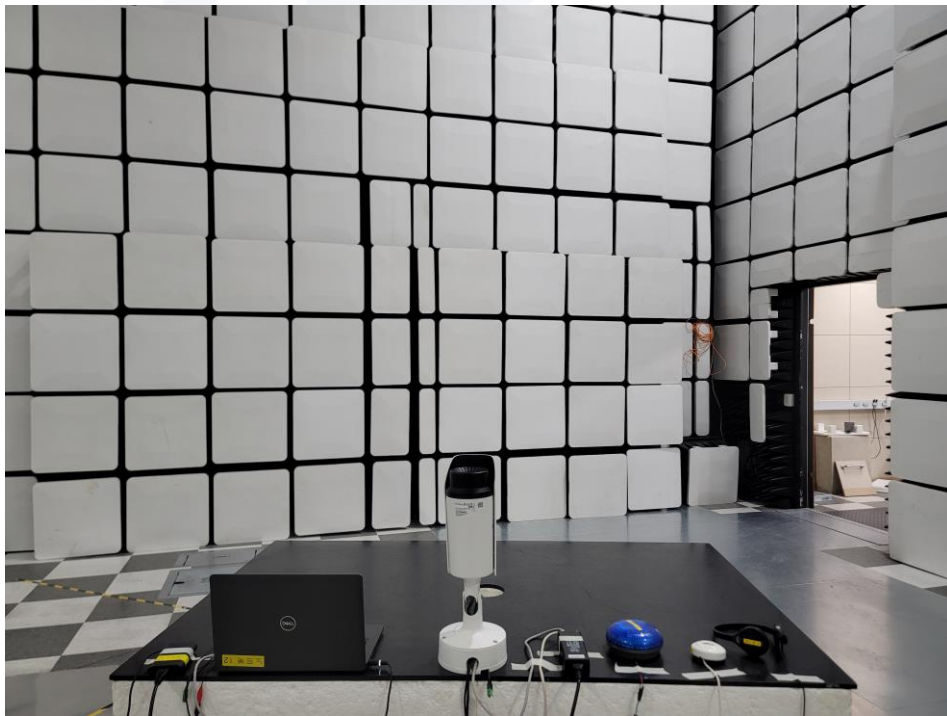
Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode





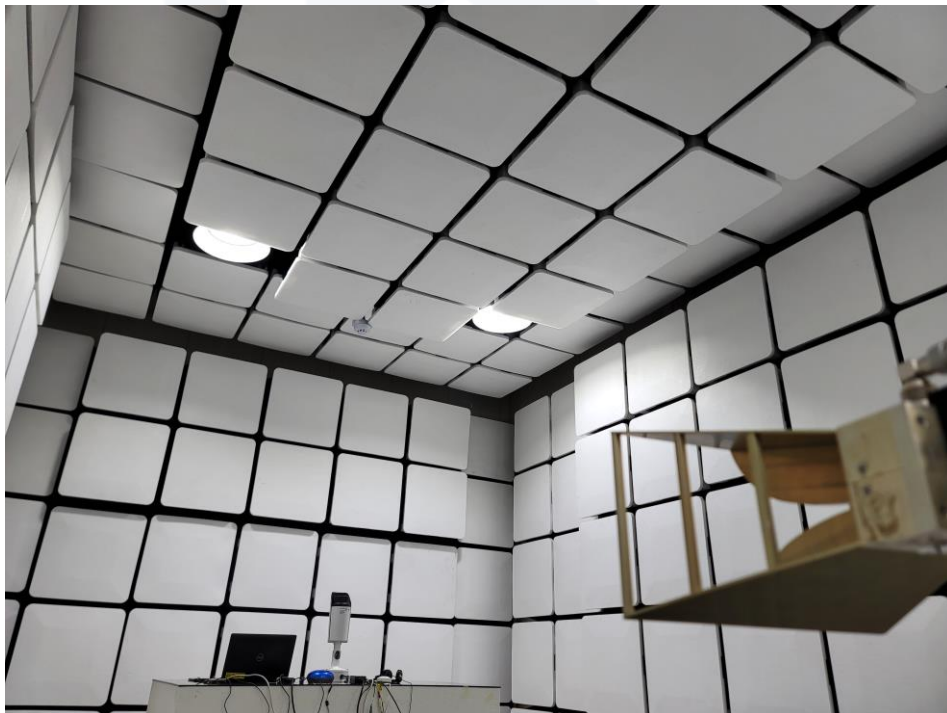
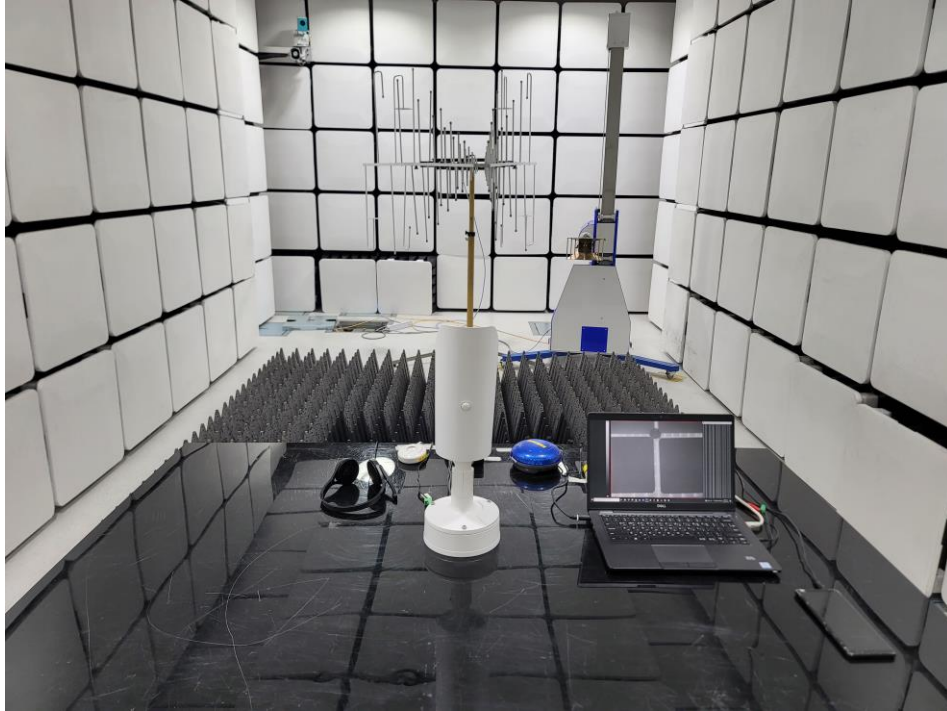
■ PoE Mode





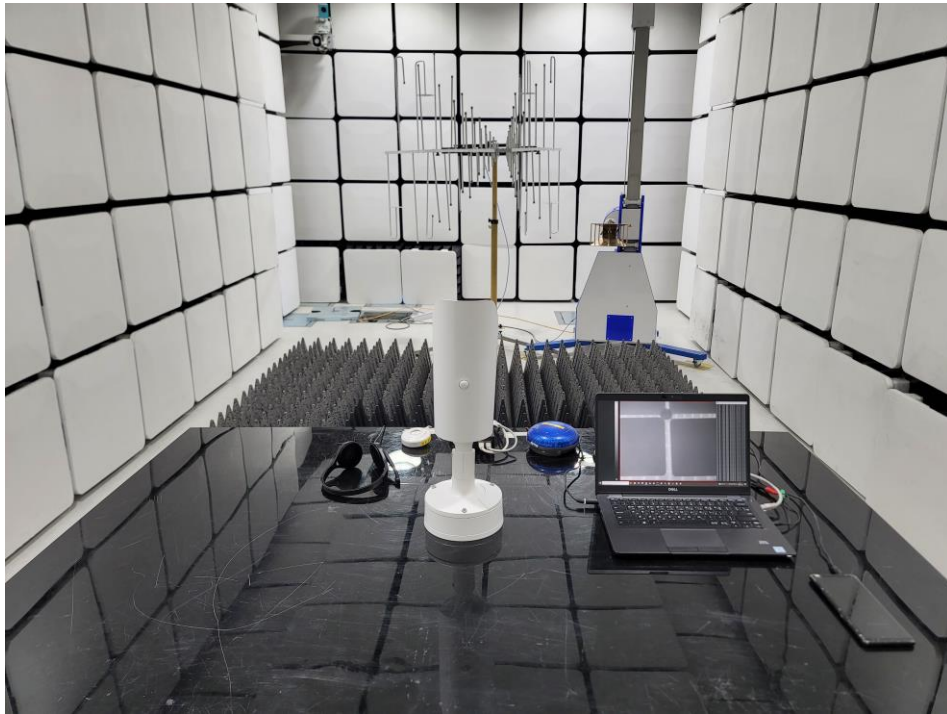
Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode





■ PoE Mode





Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode





Electrostatic Discharge

■ DC Mode



■ PoE Mode



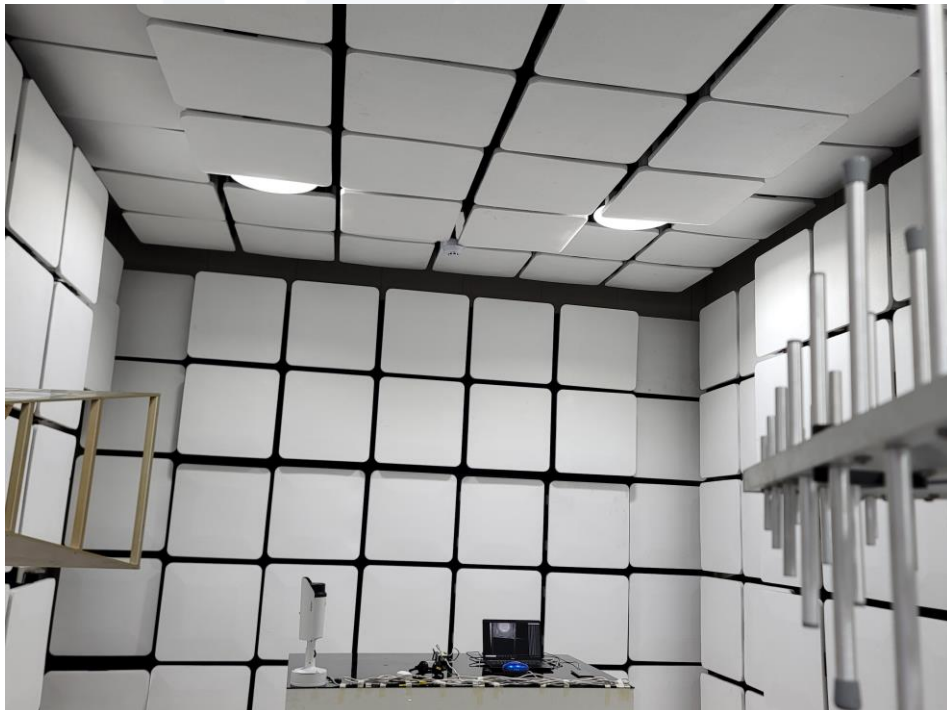


Radiated Electric Field Immunity

■ DC Mode



■ PoE Mode



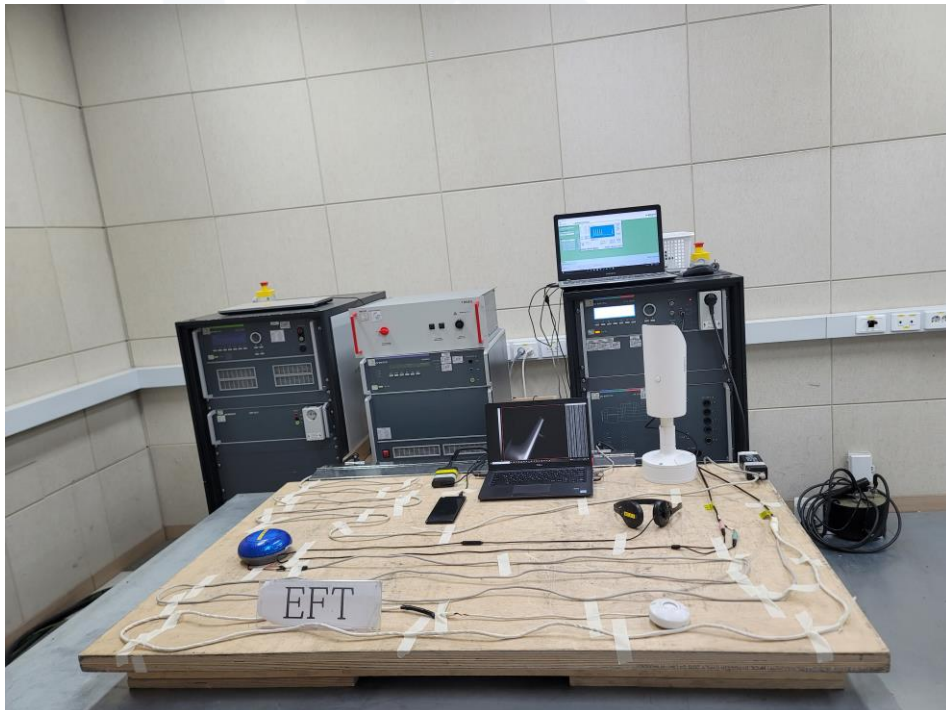


Electrical Fast Transients/Bursts

■ DC Mode



■ PoE Mode





Surge Transients

■ DC Mode



■ PoE Mode





Conducted Disturbance

■ DC Mode



■ PoE Mode





Voltage Dips and Short Interruptions

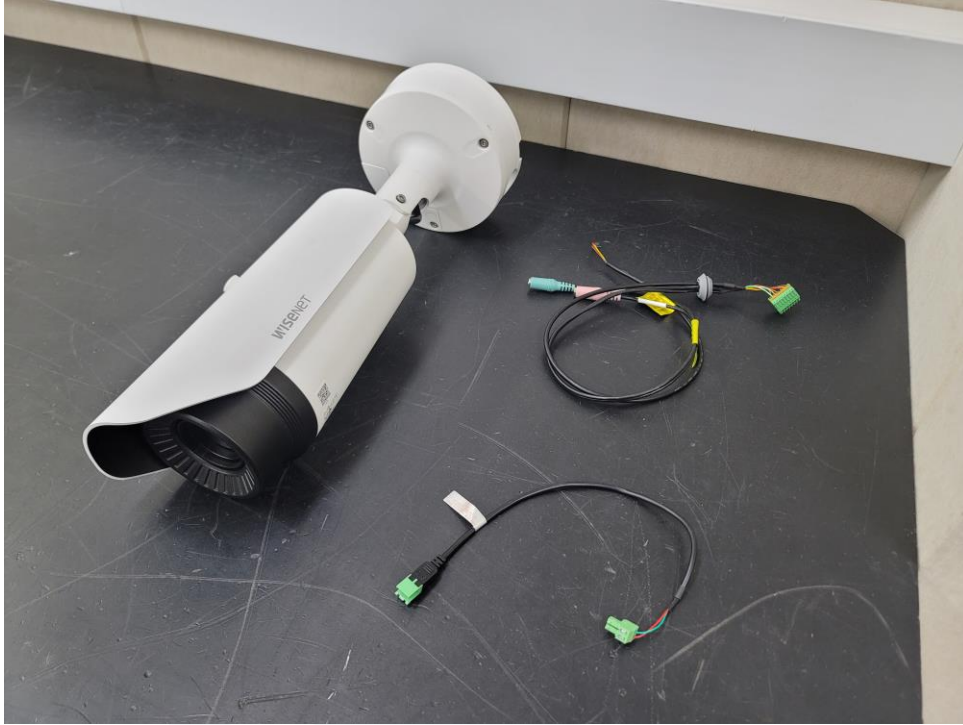
■ DC Mode



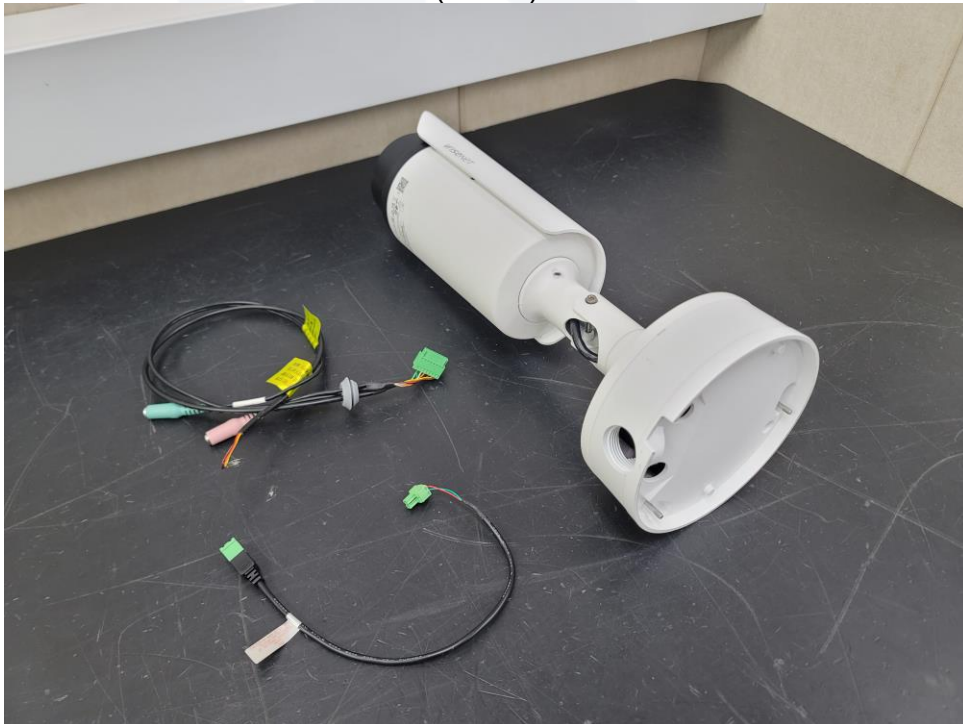


EUT External Photographs

(Top)



(Bottom)





EUT Internal Photographs

(Internal View)





EUT Internal View – NUC Board

(Top)



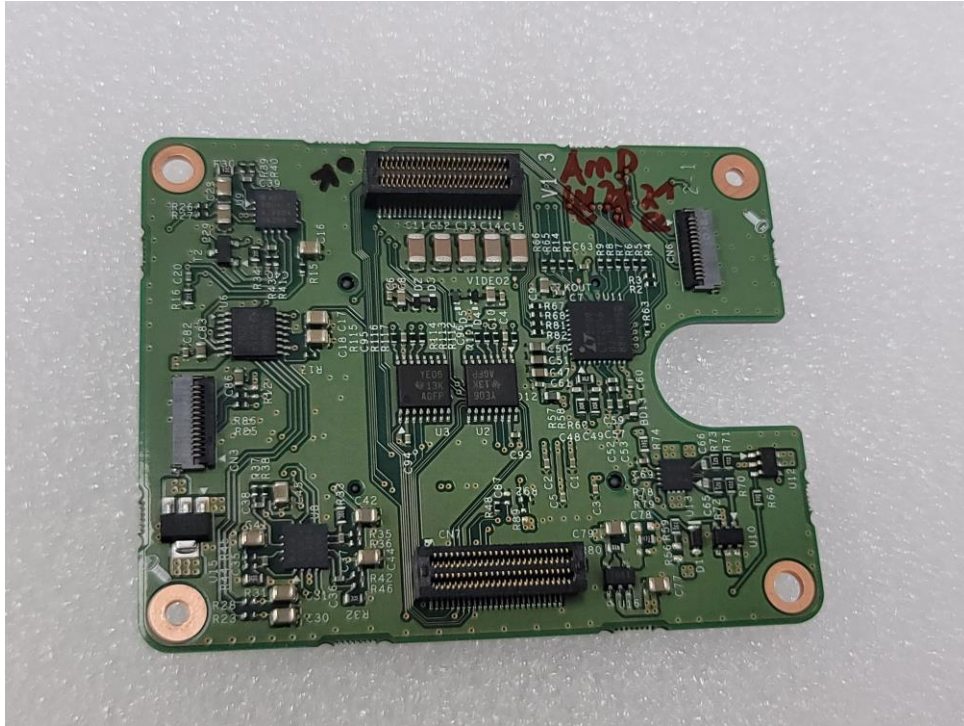
(Bottom)



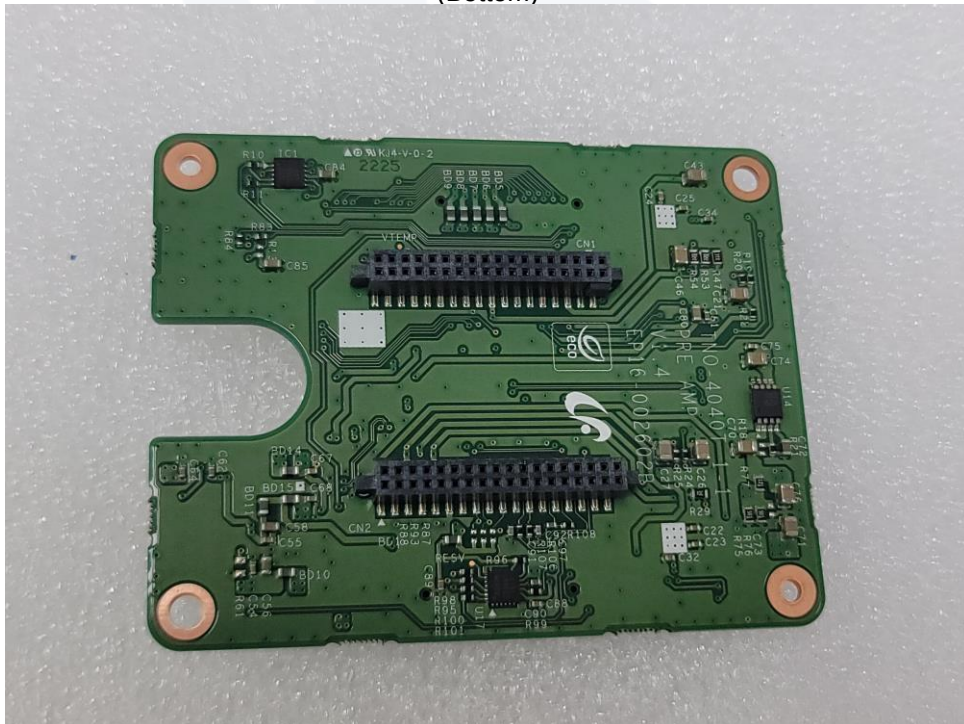


EUT Internal View – PRE AMP Board

(Top)



(Bottom)



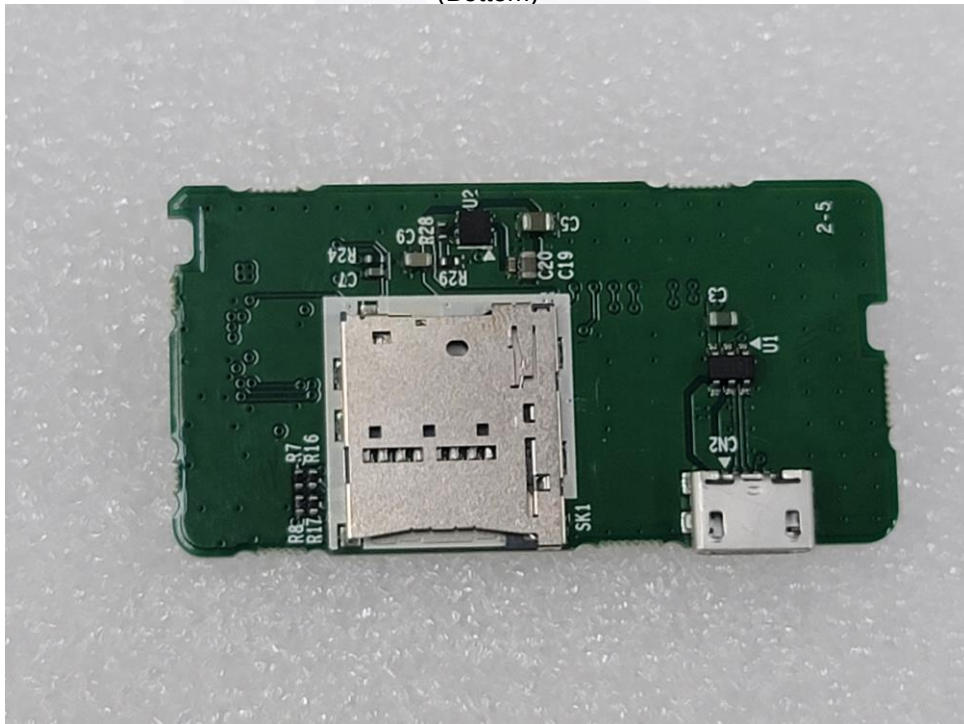


EUT Internal View – SD Card Board

(Top)



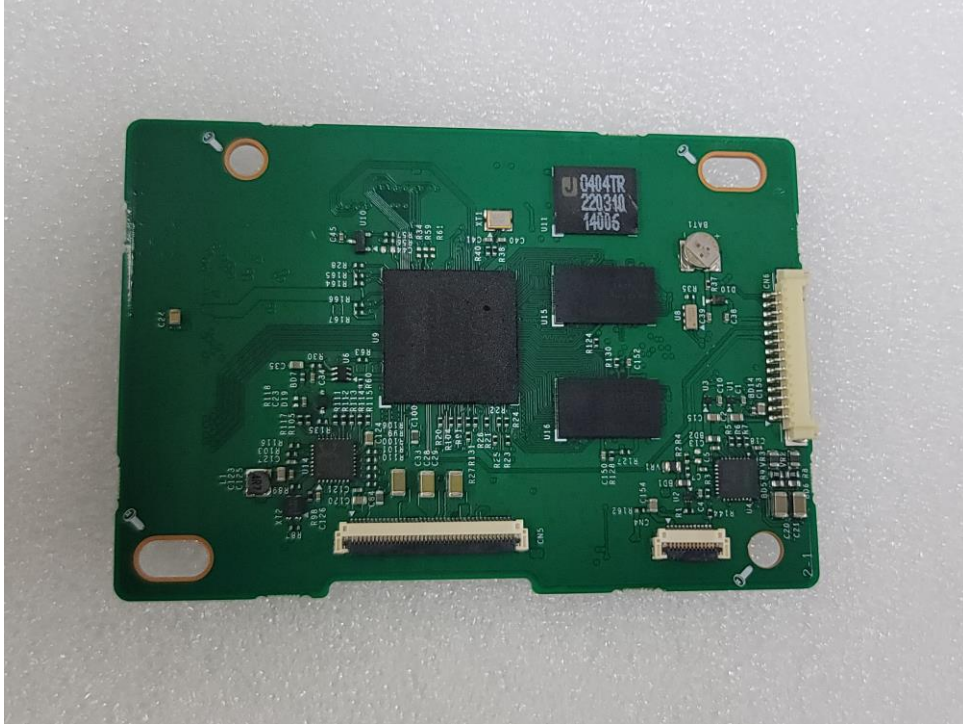
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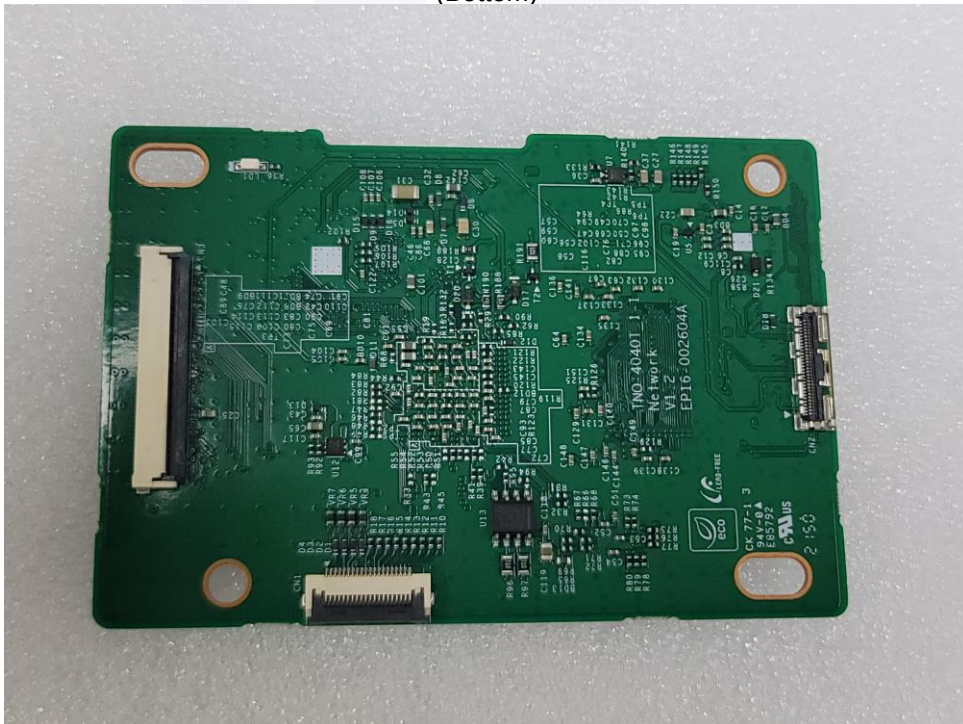


EUT Internal View – Network Board

(Top)



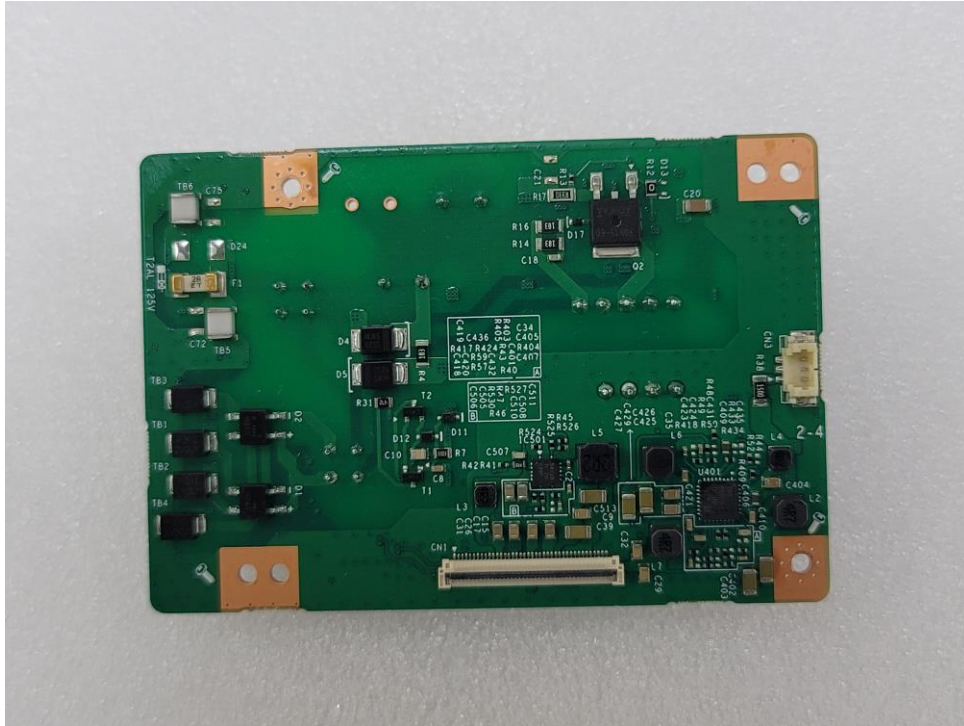
(Bottom)





EUT Internal View – Power Board

(Top)



(Bottom)





EUT Internal View – Lens

(Top)



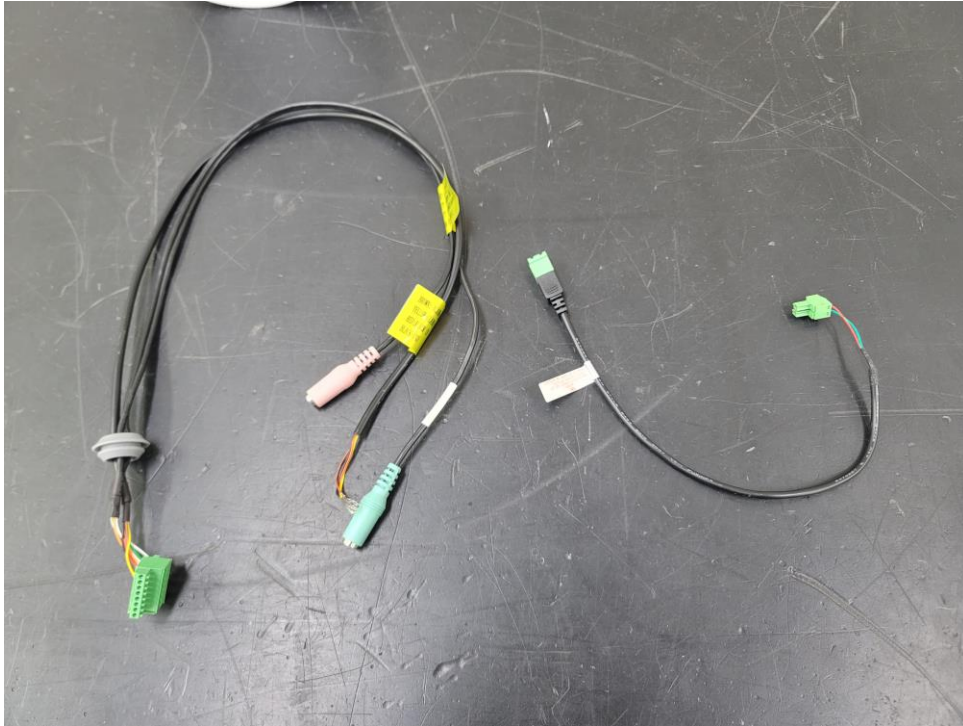
(Bottom)



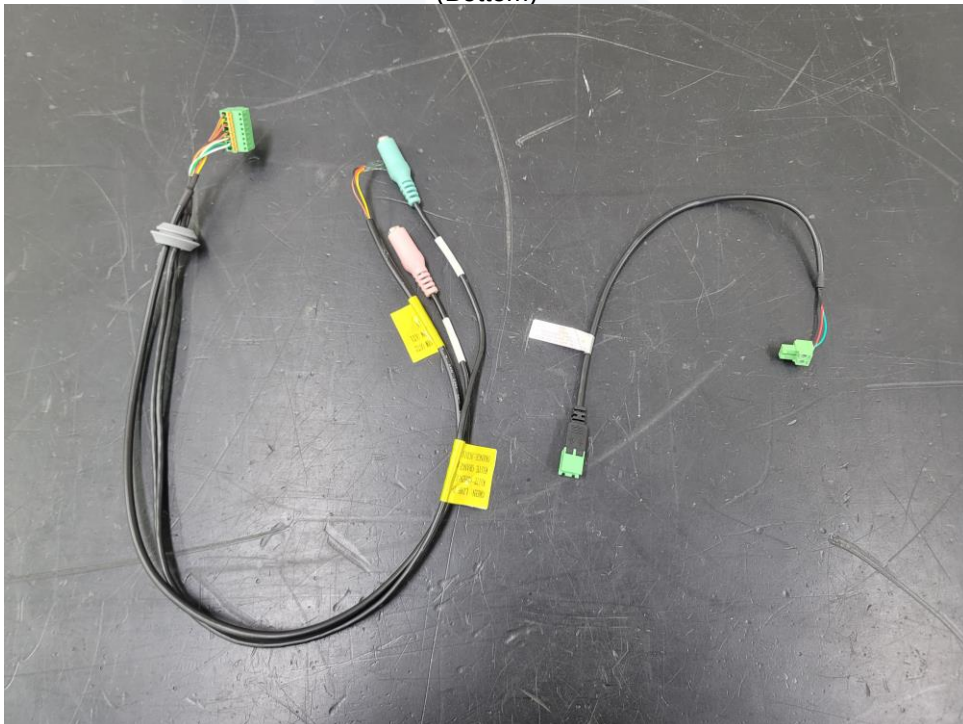


EUT Internal View – Cable

(Top)



(Bottom)





Label and Location



NETWORK THERMAL CAMERA

Model No : TNO-4040TR

Manufacturer : HANWHA VISION VIETNAM COMPANY LIMITED

Made in Vietnam

